SCIENTIFIC AMERICAN

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THE GRAVES ELEVATORS.

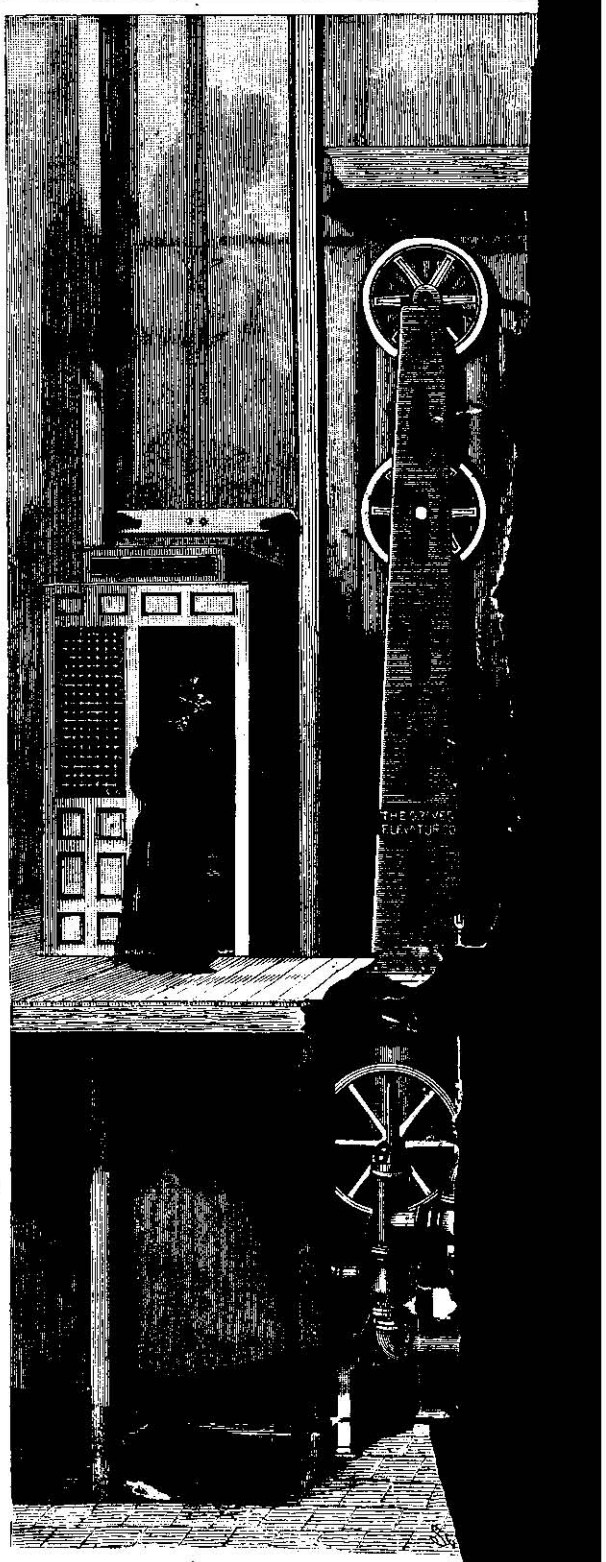
The extent to which elevators have become a necessity is a conspicuous feature of modern city life, and yet, so rapid has been their introduction, not a few of those who daily use them are constantly looking with interested curiosity, if not with apprehension, to take rapid note of their working mechanism, the safety appliances visible, etc. We illustrate herewith a few of the most recent styles of these constructions, as manufactured and put up by a company which has made a specialty of this business since 1875.

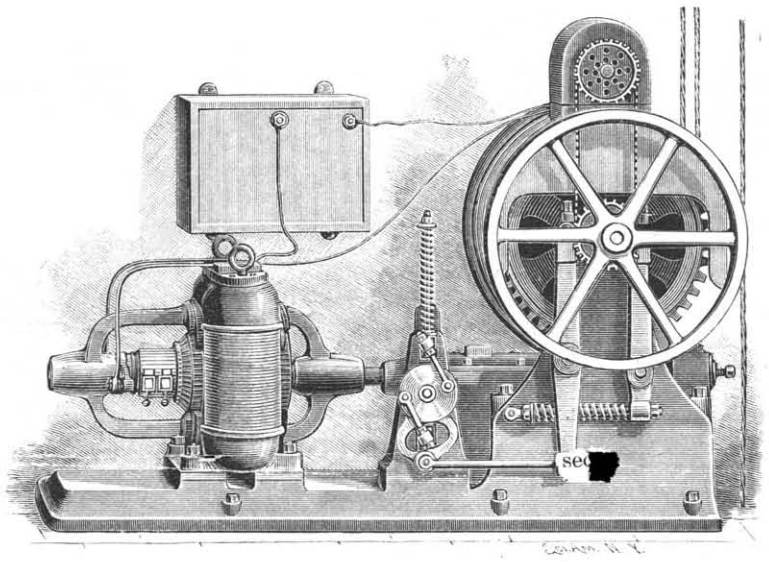
In the double hydraulic engine shown, the arrangement of the machinery for running elevators according to this system is made with one engine over the other, to accommodate buildings not having sufficient room in the proper location. The two engines are entirely separate and independent in their action, and the cars can be run separately or together. Elevators operated on this system are used in the tallest buildings, and for safety, speed, noiseless running, and long use without getting out of order, they have no superior, as they have but comparatively few parts, all strongly made, and open at all times for inspection at a glance. They are automatic and self-regulating in their operation, using steam only when the elevator is required, and pumping the same water over and over again. For extra high buildings, with high speed passenger elevators, a hydraulic engine pull machine is built, fitted with two heavy piston rods, forged wrought iron yoke, traveling sheaves carried on a four-wheeled truck, sheaves self-oiling and fitted with loose bushings, and altogether forming an extra strong and durable machine. It is claimed that this machine will operate a passenger car more miles with speed and safety than any other machine. Among the special features in these engines are improved hydraulic valves fitted with graduating piston, whereby the flow of water is cut off gradually, preventing injury to water pipes and obviating jar as the car comes to a stop. They also have a patent valve-centering device, which stops and holds the valve with water passages entirely closed, so that the car will not creep up or down.

The vertical hydraulic engine system is especially designed for use where the room is too valuable or when it is not convenient to use the horizontal system. The illustration represents the latest improved self-contained vertical hydraulic engine. It has been proved to be a thoroughly practical and durable machine in every respect, and many of them are in use. The working parts, piston, crosshead, stationary and traveling sheaves are contained in a heavy cast iron guide frame, which cannot get out of line or fall down through the car. The machinery does not occupy any room outside of the hatchway above the first floor. The construction is on the same general principles as that of their standard horizontal hydraulic machines.

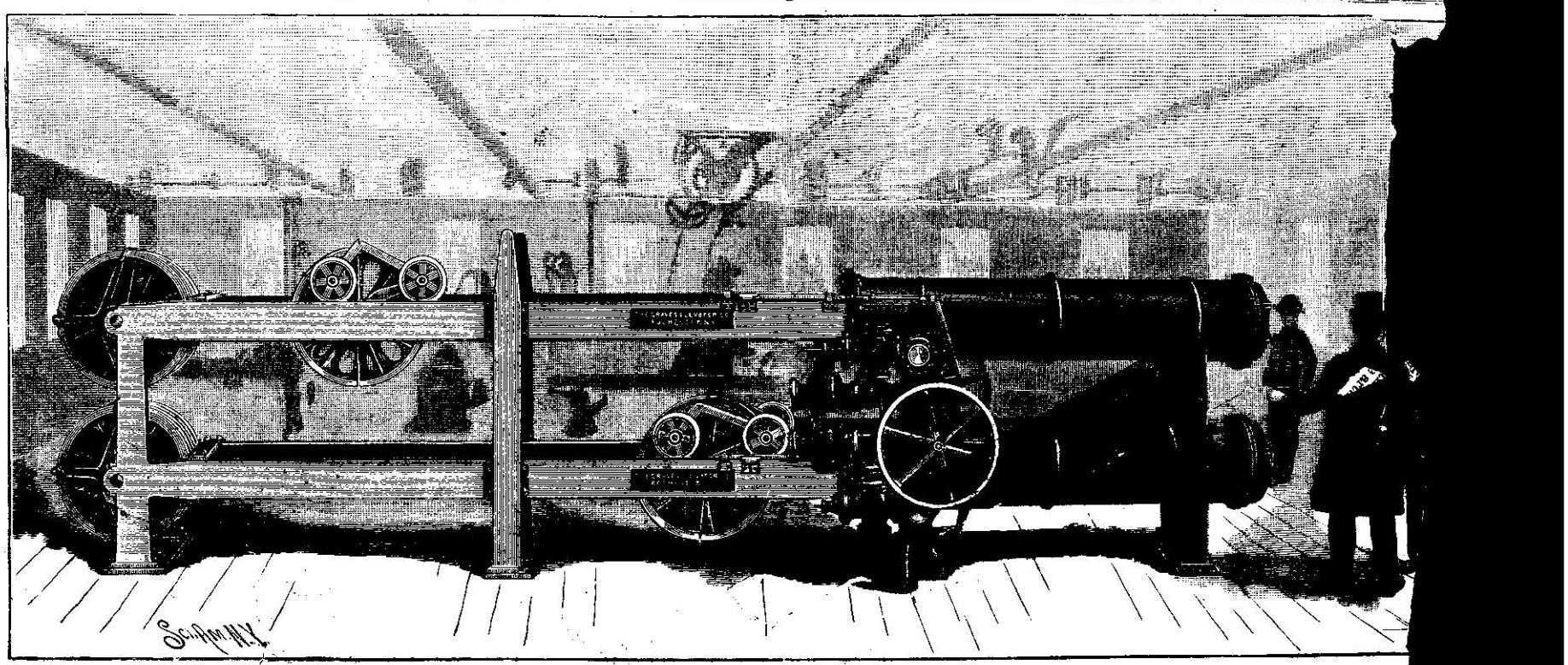
The direct connected electric passenger elevator, which forms the subject of one of the illustrations, is made from entirely new patterns, and is designed to offer a good combination for any reasonable speed and capacity. These elevators are not designed, at present, to supersede the hydraulic elevators, but they may be used in many places where it is not possible to employ any other description of elevator. The company has, within the past two years, installed many highly successful electrical passenger and freight elevators, and it is believed the latest improvements presented in this line are sure to greatly enlarge the field in which electric elevators will be employed.

The Graves Elevator Company, of Rochester, N. Y., is a corporation succeeding in a direct line to the machinery business established in that city by Mr. L. S. Graves, in 1863. A new fire-proof boiler plant has just been completed and put in operation, as also a five-story addition, 60×100 feet, to the buildings, the latter structure to be devoted especially to the building of elevator cars, for the company make all the necessary machinery and cars for their various styles of elevators.





FULLER THAN ANY OTHER.—The English, in its phraseology, is far richer than other languages. The total number of the words of the German, French, Italian, and Spanish speeches, combined, is about 180,000, while the English contains 250,000, or 70,000 more words than the total of the four tongues above named.



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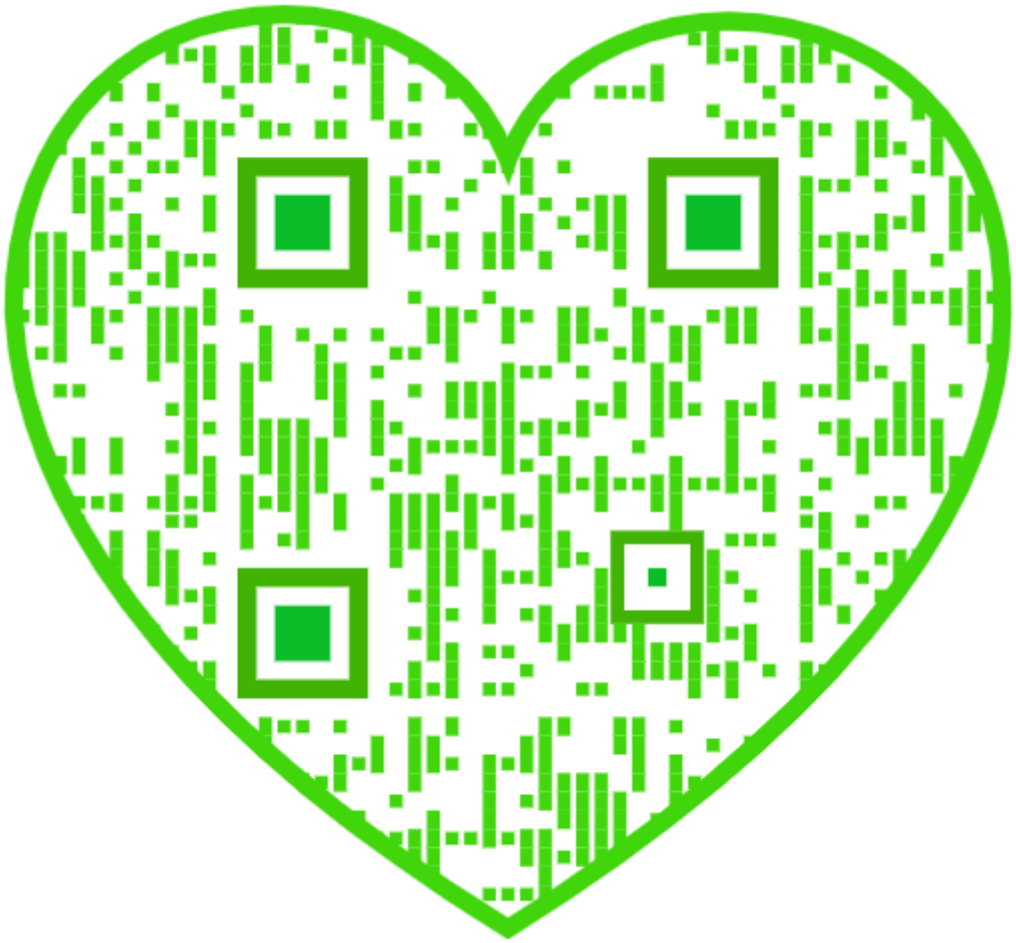

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Contents.

(Illustrated articles are marked with an asterisk.)

w colored..... 3
emists'..... 11
strong..... 3
sing on nest..... 6
..... 5
tion of..... 10
..... 18
..... 9
..... 5
proved*... 6
..... 6
..... 6
..... 5
..... 1
n, convection,
..... 11
cles of (5641).... 12
ase..... 5
cf..... 11
perature on.... 10
ly patented.... 12
teamer..... 3
Lamps, street, lighting 5
Lighthouse, Minot's Ledge..... 8
Machine, electric drilling*..... 4
Machine, sculpturing automatic*. 4
Merchandise sales law..... 10
Mummied animals..... 7
New books and publications..... 12
New York, cruiser in dry dock*.. 8
Paint, luminous..... 8
Peanuts as food..... 8
Petroleum, brief history of..... 7
Photographic notes 6
Photography in Russia 11
Photography, snowflake..... 6
Plants, growth in odd places*..... 4
Press, belting, double*..... 5
Reaper, Rugg, of 1844..... 3
Sea sickness, cure for..... 7
Solar cautery, antiquity of..... 7
Tectorium, glass substitute*..... 9
Treadmill power (5643)..... 13
Widah bird*..... 11
Zinc, oxide, manuf*..... 9

ABLE OF CONTENTS OF

C AMERICAN SUPPLEMENT

No. 940.

Week Ending January 6, 1894.

e 10 cents. For sale by all newsdealers.

PAGE

URE.—The Chestnut Oak.—A fine foliage tree of ature when growing in England.—1 illustration 15018
The Density of the Earth.—By HENRY WURTZ. he earth and its mystery.—The figures obtained vers tabulated..... 15028
ce.—A Study of the Origin of its Features.—By G. onclusion of this very interesting paper on lunar the causes which have produced its characteristic istration..... 15016
Y.—Anthony Reisenzaun.—Recent death of a dis- ctrician, with notes on his life..... 15024
NEERING.—The Peradenia Bridge, Ceylon.—A in great part of satin wood, recently re- iosity of engineering.—1 illustration..... 15023
SITION.—The Columbian Exposition.—By glish china and pottery as shown at Chicago 15021
EXPLORATION.—Antarctic Exploration. st the English government in explorations le of the earth..... 15015
—Stanhopea Lowii.—A beautiful flowering bed in *Kew Bulletin*.—1 illustration..... 15018
NGINEERING.—Portable Oil Engine.—A e power engine driven by oil.—Mounted on on.—1 illustration..... 15022
ING.—The Extraction of Kaolin.—How ified in France.—2 illustrations..... 15020
New Cow Milker.—A curiosity in inven- 1 illustration..... 15019
ng Sled.—By FRANCIS T. FREELAND.—A drawings, of an improved double runner ations..... 15024
graphic description of the leader of the dmiral Mello.—The condition of his flag- r of Rio.—1 illustration..... 15025
Y.—Rescuing an Elephant Calf from a Pit- LMORE.—An interesting episode in natural 15015
esting Artillery Experiments at Elswick.— he products of the Elswick gun works in illery experiments..... 15025
Luminiferous Ether.—The mystery of light Our ignorance concerning it..... 15028
Scientific Knowledge.—By Lord KELVIN.—An William Thomson's presidential address before of England.—Presentation of medals..... 15029
NGINEERING.—Burned Clay Ballast.—By S. E. interesting development of American railroad uction of ballast from clay.—A substitute for Illustrations..... 15022
a and Bolivia Railroad.—A trans-Andine rail- ributary to the needs of the mines..... 15022
r Speed Recorder.—A machine for recording engine and keeping accurate watch on the gineer.—6 illustrations..... 15023
—Fermentation.—By C. C. STAUFFER.—The germs, with typical patents and inventions industries of fermentation.—6 illustrations... 15026
Y.—A valuable contribution to indoor carpen- he proper methods of working hardwoods..... 15020
ndustry in France.—How the work of drying n France.—2 illustrations..... 15018
er Industry in Russia.—A struggling industry f the system and methods of carrying it on. 15019

PATENT LITIGATION AND COMPROMISE.

A saying which has become almost an axiom with patent lawyers is to the effect that there is no money in an accounting. A suit for infringement of patent is prosecuted in the federal courts of equity under a motion for injunction and a claim for an accounting. This motion and claim are brought by the owner of the patent against the alleged infringer. If the court sustains the patent, a permanent injunction is granted and the matter is passed into the hands of a master. Here books are examined, profits are discussed. and the question of how much in the shape of past profits or royalty should be paid by the enjoined party to the owners of the patent is settled.

These proceedings before the master are often of almost interminable length. Account books, perhaps of many years' accumulation, are submitted, every vantage point is contested by the opposing lawyers, and when all is settled there is apt to be little left of the accounting for the benefit of the holders of the patent. Sometimes they receive an award so great as to be uncollectable, when a compromise is in order. The great expense of the proceeding, including master's, experts' and lawyers' fees, makes it something from which the experienced shrink. A conscientious lawyer will generally advise his client to make the best compromise possible rather than to plunge into an accounting of uncertain duration and expense.

The unsatisfactory accounting, which is theoretically the object of a patent suit, is really the outcome of something which is also unsatisfactory in many cases —the injunction awarded the patent suit itself. The latter form of proceeding has become very expensive. Competent lawyers must he retained and the best experts must testify in patent suits. The records are taken down word for word from the witnesses, and the time consumed and, consequently, the *per diem* bills of master, counsel and experts rapidly mount to large proportions.

It is said that at a recent meeting of some of the great electrical interests it was shown that enough money had been spent in lawsuits to pay dividends for several years. Lawsuits are a very unsatisfactory instrumentality for virtually increasing the capitalization of companies. A million of dollars sunk in a suit represents so much additional capital on which interest must be paid. This kind of expenditure cannot legitimately be treated as working expense.

The practical moral would seem to be that owners of patents should avoid too inelastic or abstract a treatment of their rights. There is little glory in maintaining a patent—it is all a matter of business. If, therefore, a certain revenue can be obtained by licensing a presumed infringer, it is often better to do so than to sue with uncertainty of success. It may be safely said that no one knows how limited his patent is until it has been through the courts. By compromising his claims an inventor will usually obtain an acquiescence in a wider interpretation of his patent than he could hope from the action of a court. The various companies who were infringers of the Edison lamp patents were willing, it is said, to pay a royalty of ten cents a lamp and acknowledge the validity of the patent. Probably it would have been wiser to have accepted this payment rather than to have continued the litigation.

THE ALKALI METALS POTASSIUM AND SODIUM.—II.

THEIR ALLOYS AND AMALGAMS.

In continuation, we must supplement our statement of the properties of these metals somewhat. At its melting point, sodium is as liquid, mobile and lustrous as mercury. It instantly tarnishes in damp, but not in dry air. It becomes pasty at about 122° F. At the ice temperature it is still ductile, but below zero Fahrenheit becomes brittle and crystalline. Sodium stands high as a conductor of heat and electricity, being in these respects surpassed only by gold, silver and copper. Hence, in cases where mercury is applied as a mobile liquid conductor, the liquid alloy might be preferable—protected, of course, from damp air. say by inclosure in a space communicating with the air only through a tube containing calcium chloride.

An American chemist, Charles A. Seeley, now deceased, discovered a surprising property of these alkali metals. They dissolve, *as metals* apparently, in liquefied ammonia gas, and on evaporation are left in their original metallic forms The solutions are transparent and of deep blue color.

As aforesaid, the discoverer of the alkali metals found that mercury containing a little of them would enfilm, or wet (so to speak), iron, steel and platinum. About 1840 an English chemist, Robert Mallet, discovered also that melted metals having no natural affinity for iron dissolve it rapidly when containing a little sodium or potassium. An American chemist, Henry Wurtz, took up these subjects in 1857, and carried them much further. He made very numerous experiments and inventions in this field, and patented some of them. The cost of sodium then ranged in this country from $8 to $10 per pound; and his inventions, patented prematurely. about 1865 or 1867, were, therefore, of no economical value, and have long been public property. Now that it is proved, however, by Castner's work, that if a market exists for sodium it can be produced at a cost of 18 cents per pound, and the liquid alloy doubtless for little more, these forgotten devices should be revived and improved upon by supplementary inventions. Some of these methods of H. Wurtz were as follows·

First.—A method of rapidly making these metals into solid amalgams, in which forms they can be handled, and their great energies and affinities utilized, without danger or difficulty. Combination with mercury involves great and usually highly explosive evolution of heat, which Wurtz obviated by a very simple device. Instead of starting with pure mercury, he employed a pasty amalgam, containing about two per cent of the alkali metal; this being about half saturated; for solid, hard, fully saturated amalgam of sodium contains but four to five per cent. A series of iron pans is set in a row, with a small Bunsen burner which can be moved from one to the other. A lump of sodium, averaging a third to a half ounce, is placed on the amalgam in one of these pans, with a little paraffine wax as a flux. The burner is then applied beneath, until the sodium, without any explosion, suddenly melts down into a thin cake of bard amalgam floating on the poorer amalgam below, which is itself liquefied by the heat of the reaction. This cake is removed with tongs to a ledge on one side of the pan to cool, and the next pan operated upon. Unless the number of pans is too large, the burner need be used but once with each of them, as the heat retained is sufficient to produce immediate combination. One operator could in this way make a thousand pounds daily of saturated amalgam without an explosion. The cakes are all melted together under paraffine in iron kettles, and cast into ingots or other shapes desired. To use the liquid alloy in this way some modifications will be required in the manipulation, which experiment and invention will readily evolve.

Second.—A very little of such amalgam added to mercury was found by H. Wurtz to intensify so greatly the adhesion of the mercury to gold and silver that when these occur in ores in such forms as to be untouched by ordinary mercury, this prepared mercury instantly amalgamates and absorbs them.

Third.—When mercury becomes "floured" or "sick," as it is called, a little sodium amalgam wholly cures it, and coalesces the detached globules instantly. The water in the apparatus slowly dissolves out the sodium, but it will be a very simple matter of invention, now that sodium is applicable with great profit to such ores, to devise plans of feeding the amalgam automatically to the battery and pans in minute graduated quantities.

Fourth.—In alloying metals much trouble is often experienced through obstacles in the nature of such metals. Many such difficulties altogether disappear when a little sodium is present.

Fifth.—Wurtz invented also the now familiar addition of sodium to various kinds of *solders*, and to baths for coating iron and copper with zinc ("galvanizing," so called), lead, tin, and divers alloys.

Sixth.—He devised a plan for removing the sodium and mercury (if present), when desirable, from such metallic coatings, by washing them out, so to speak, in a secondary bath of the same metal. When this secondary bath becomes charged with sodium, it is used as a primary bath. The primary baths need not contain any mercury, as, with proper precautions. the sodium itself may be incorporated directly with other metals.

The best "pickles" and fluxes for these widely varying operations of coating, etc., will become subjects of invention. We should warn experimenters that nothing can be done with *aluminum* in this field. Mercury destroys it rapidly.

In another article methods of direct production of the liquid and other alloys, with applications of electrolysis to their manufacture and manipulation, will be indicated.

THE NEW STEAMERS OF THE INTERNATIONAL NAVIGATION COMPANY.

It will be remembered that two years ago Congress passed an act authorizing the placing of the American flag on the two splendid ocean steamers Paris and New York, which vessels, although chiefly owned by American citizens, were built in England. The conditions for the American registry were, among other things, that the company should build, as soon as possible, in this country, not less than two new vessels of at least equal size and speed to the vessels above named, and that they should be constructed of American materials throughout. In this way some encouragement to American ship building would be secured. Another provision was that the new ships should be adapted to use as cruisers in case of war.

In accordance with the above law the company entered into contracts with the Cramp Ship Building Company, Philadelphia, for the construction of two

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new vessels of American design and manufacture, and they are to be launched next spring.

At the recent annual meeting in this city of the American Society of Naval Architects, Mr. Charles H. Cramp read an interesting paper, in which he reviewed the rise and progress of fast Atlantic steamers, giving a brief account of the dimensions, power, and performances of each. He concluded with the following particulars of the two new steamers above alluded to:

"We are, as is well known, building a couple of 536 feet ships for the International Navigation Company. They are both framed up about two-thirds of their length amidships, and plating is in progress. They will be launched next spring, and will go in commission about a year from n w.

"Their principal dimensions and qualities are as follows:

Length on load water line	536 feet.
Length over all	554 "
Extreme breadth	63 "
Moulded depth	42 "
Gross register	About 11,000 tons.
First cabin capacity	320 passengers.
Second cabin capacity	200 "
Third cabin capacity	900 "

"Their propulsion will be by twin screws, actuated by two quadruple expansion engines on four cranks, which, with steam at 200 pounds, will probably develop about 20,000 collective indicated horse power. To support the outboard shaft bearings, the hull is built out in a horizontal web to a steel frame having both bosses cast in one piece and weighing about 68,000 pounds. The after deadwood is cut away, and the keel slopes up so that the shoe meets the boss frame at the after end. It will be observed that these ships are considerably larger than the New York and Paris, or about half way between them and the Campania class. I will not venture a prediction as to their probable performance, but I will guarantee them to be perfectly safe, comfortable, and economical ships.

"These ships are American from truck to keelson, no foreign material enters into their construction. They are of American model and design, of American material, and they are being built by American skill and muscle."

A Yellow Colored Alloy from the Fusion of Two White Metals.

BY J. D. DARLING.

Professor Richards, in his book on aluminum, page 299, first edition, quoting from Tissier's "Recherches sur l'Aluminum," says: "Aluminum unites with platinum with great ease, forming with it alloys more or less fusible. according to the proportions of aluminum. Five per cent of platinum makes an alloy not malleable enough to be worked; it is possible that by diminishing the amount of platinum a suitable alloy might be produced. In color it approaches that of gold containing 5 per cent of silver."

Three or four years ago, being engaged on experimental work with a process of electroplating with aluminum, the writer attempted to make an alloy containing 5 per cent of platinum, by fusing the proper proportions of aluminum and platinum in a crucible, with the idea of using the resulting alloy as an anode to plate from, but failed to obtain a colored alloy; most likely because the heat used was not high enough, although on pouring out the contents of the crucible, the platinum had disappeared and seemed to have combined with the aluminum.

But I succeeded in obtaining a yellow colored deposit of a rich appearance, by electrolyzing a hot solution of certain salts of aluminum and platinum; and as the result is rather curious and interesting, I will describe the solutions used and how to make them.

First prepare a solution of mono-sodic aluminate, $Na\ Al\ O_2$, in the following manner:

Take the precipitate obtained by adding a solution of sodium carbonate to a solution of aluminum sulphate, and, after washing it once with clean water, boil it with aqua ammonia until the white precipitate becomes gelatinous and assumes a slightly blue tint, then wash it with clean water until the wash water is free from sulphates. Dissolve a weighed quantity of pure caustic soda in water and bring to a boil in an iron pot and add the washed precipitated aluminic hydrate, a little at a time, until no more will dissolve. The solution of mono-sodic aluminate thus formed is, after cooling, filtered and diluted until each gallon of solution contains 130 grammes of metallic aluminum. This can be easily figured out when the amount and purity of the caustic soda used is known.

There are other ways of making mono-sodic aluminate solution, but when made in the above way it is not so liable to decompose on standing.

Next dissolve 6 grammes of platinum in nitro-muriatic acid and convert it into the double cyanide of potassium and platinum by adding a solution of pure potassium cyanide to the solution of platinum chloride until the precipitate first formed redissolves.

To prepare a plating solution that will yield a yellow deposit, take one liter of the mono-sodic aluminate solution and put it in an earthenware jar along with 60 grammes of pure potassium cyanide, and heat the whole to 130° F. Then add the platinum solution. On passing a current from three Bunsen cells through the bath, using a carbon or platinum anode, and a strip of zinc as a cathode, the zinc is plated in from fifteen to twenty minutes, with a film of golden colored alloy.

As it is a difficult matter to prepare a plating bath so that the conditions will always be the same, it is advisable to add the platinum solution slowly, while the current is passing through the bath, until the deposit is of the right color. It may take a little less or a little more than the above mentioned quantity of platinum, but that was about the average quantity used in the preparation of several one liter baths, in which a variety of objects, such as the blades of steel dinner knives, razors, etc., were plated.

An examination of the deposit showed the presence of aluminum and platinum, but the exact proportions were not determined.

The Rugg Reaper of 1844.

A curious and interesting contribution to the history of inventions has appeared in a recent number of the Chicago *Inter-Ocean*. It tells of the work of an inventor, Geo. H. Rugg, done in the forties. In the spring of 1845 Mr Rugg, then 22 years old, built a reaper. To make his castings a special heat was taken in a Chicago foundry, the place being then little more than a village. He cut 120 acres of hay on his own farm with it the first season. He had no thought of building more, but the next spring a couple of machines were ordered from him. As he says, he "like Putnam, left the plow standing in the field," and built the two machines. He tried to improve his first machine. He substituted for straight cutting blades and single diagonal edged fingers, diagonal or saw tooth cutters and straight edged double fingers. The latter being made double, the blades worked through slots, on the system used universally at the present time. He cut up a saw to get material for his blades. The young farmer-inventor applied for a patent, but his claims were rejected on reference to the Jonathan Read patent of March 12, 1842, and to the John F. Nicholson application, filed October, 1844. A perusal of the case impresses one with the idea that the merits of the invention should have insured it more hospitable treatment.

From Mr. Rugg, now 70 years old, we have received the following characteristic letter:

I inclose an article from the *Inter-Ocean*, of Chicago, the history of the Rugg reaper. I take it you are interested in a correct history of reapers, and the article I inclose is mainly the record of the Patent Office, and I judge, from your knowledge of patents, you will see I was wronged out of a valuable invention, which is now too late to correct, except as a matterof history; and as an old patron of your paper, also in having employed your agency in obtaining patents, I trust you will give this a careful perusal.

Ottawa, Ill., Nov. 16, 1893. G. H. RUGG.

Wonderfully Strong Armor.

The recent testings at Indian Head of the side armor of the Maine have been of great interest, as this is the first armor of the Harvey type ever made for use on a war vessel, either in this country or in Europe.

Before this trial took place the advantages of the Harvey process had been made plain by firings at comparatively small plates of uniform thickness. Yet it remained a question whether difficulties would not arise when the process should be applied to the various shapes required in actual armor. It was a matter of doubt whether the process of hardening would not so warp the plate that it could not be applied to the ship; or whether variations in thickness and form might not make it difficult to secure armor of uniform character.

The plate tested was 13 feet 7 inches long, 7 feet wide, and 12 inches thick for one-half its width, the other half tapering to 6 inches. It represented a lot of 475 tons of side armor. Commodore Sampson attacked this plate with two 8-inch armor-piercing projectiles, of which the first had one-half more energy than was necessary to take it through the same thickness of wrought iron, while the second had twice the energy required for perforating such a thickness of wrought iron. The result of the firing was that both projectiles were smashed to fragments against the plate, their points having penetrated only four or five inches, and having been there firmly welded. In other respects the plate was wholly without injury. The velocity of the second projectile had been 2,004 feet a second, and the energy 6,968 foot tons. That was the acceptance test, prescribed by the contract, and most satisfactory it had proved. Of course it passed the whole lot of 475 tons, which will duly be put upon the Maine.

But how much more could that plate have endured? This was a most interesting inquiry, and subsequently it led to a far severer set of tests. To begin with, the plate was fired at by an armor-piercing 8-inch shell having a rounded point, with a velocity of over 2,000 feet a second, so as to determine whether the blunter form of projectile could not gain some advantage over the hard surface of the plate. Yet, like the other two, it was smashed into exceedingly small pieces without inflicting visible injury to the plate beyond the point struck. Then, still another 8-inch shell, making four in all, was fired, striking at an angle of 35 degrees with the normal, and near one end, so as to see whether such a blow would not crack the plate; and once more the high velocity of 2,004 feet a second was imparted. The result was no crack at all, and, in fact, less injury to the plate than had been received at any of the previous fires.

The 8-inch gun having thus been completely defeated, a big 10-inch gun was brought up and trained against the same plate, already four times struck. Of course, it is highly improbable that any one plate on a ship would ever be hit so many times in battle. The first 10-inch shot was fired at a part of the plate which had been struck twice before, at an angle of 35 degrees, with an energy of 13,564 foot tons, or nearly double that of any one of the 8-inch projectiles. The plate, naturally, was cracked, yet the projectile was broken into fragments, like the others. Finally another 10-inch projectile, with an energy of 9,806 foot tons, was fired at a point 2½ feet from any of the previous shots, and while the only cracks developed were three very fine ones, the shell, likeall the other five, was smashed to pieces. The plate would still have given complete protection to the ship, and might have been struck several times more without failing in its office.

By how much, then, does our Harvey plate surpass in efficiency any other? The experts, from a mathematical comparison, find it to be about 25 per cent better; but the practical advantage would be still greater, because it can keep shot out where even nickel armor, if un-Harveyed, would not, so that the ship would be lost. Well did Secretary Herbert announce in his current report that the value of this surface-hardening process is so conclusively shown that it will be applied not only to all armor under new contracts, but, as far as practicable, to armor already under manufacture. The Maine and the Texas, the battle ships of the Indiana type, and the Puritan and the Monadnock, are among the vessels approaching completion which will profit by this decision.—*N. Y. Sun.*

The New Atlantic Steamer Kensington.

There was launched on October 26, from the shipbuilding yard of Messrs. James & George Thomson, Limited, Clydebank, the Kensington, a twin-screw steamer of about 9,000 tons, built for the International Navigation Company, to ply between Philadelphia and Liverpool. Her dimensions are: Length between perpendiculars, 480 feet; breadth, moulded, 57 feet; and depth, moulded, 40 feet. The vessel, which is throughout of Siemens-Martin steel, has a straight stem and an elliptic stern. She is in all respects at least up to Lloyd's requirements, and is, in addition, subdivided by nine watertight bulkheads.

The vessel is to carry 8,000 tons, at a draught of 28 feet, and is fitted with very complete arrangements for handling cargo expeditiously. There are ten powerful steam winches. There is an extensive installation of refrigerating machinery in separate sections—one for perishable cargo and the other for the ship's requirements.

Although intended as a first class cargo-carrying steamer, the Kensington has accommodation in large staterooms amidships on the upper deck for about 120 passengers, as well as for the officers of the ship; and on the bridge deck above is the dining saloon, a well-lighted, commodious apartment in polished oak, which is seated for 126 persons. There is, in addition, accommodation on the main deck for over 1,000 emigrants, and great care has been bestowed on the ventilating, heating, and sanitary arrangements of these particular spaces.

The ship has four steel pole masts, rigged fore and aft, and one large oval funnel. The engines are of the direct-acting, surface condensing, quadruple-expansion type, with four cylinders working on four cranks. The cylinders are 25½ inches, 37½ inches, 52½ inches, and 74 inches, and the stroke 4 feet 6 inches. The boilers are designed for a working pressure of 200 pounds per square inch.

THERE is no paper that comes more promptly every week than the SCIENTIFIC AMERICAN, and there is none that is more just to its exchanges. It "clips" extensively, but ablest judgment is employed to select only such matters that are of authority and merit in every branch of science, mechanics, art and manufactures, thereby concentrating the best brain of the whole world. Its editorial subjects are always reliable and the result of careful researches. The paper is now in its 69th volume and was established 48 years ago. Messrs. Munn & Co., publishers, are not only entitled to the praiseworthy financial success that they made for themselves, but deserve much acknowledgment for the good that they have rendered to the progress of every industry of all nations. The benefit that has been derived from this very instructive journal cannot be estimated, as the good that grows out of the elevation of skill and knowledge is beyond computation.—*Chicago Clay Journal.*

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THE GROWTH OF PLANTS IN ODD PLACES.

It has been said that if an absolutely clean plate were placed out of doors, it would, after a certain length of time, become covered with small plants taking root in and sustenance from the dust that had been deposited upon it. The fact is that mountains furnish us at every instant with examples of the facility with which trees and other plants obtain nourishment upon absolutely bare surfaces. In the mountains of the Jura especially, the firs adhere to and live upon the exposed rocks; and in the defile of the Roches, upon the route from Gros-Bois to Locle, all tourists are acquainted with the tree that has grown upon the very edge of the rock forming the northern crest. We have collected a few peculiar cases of plants that have taken root in the masonry of certain buildings We shall, in the first place, take our readers to the charming little church of Fenioux, in the department of Charente Inferieure. It is a little gem of Roman art situated between the villages of Grandjean and Mazeray, upon the line from Bordeaux-Etat to Paris. Arriving in front of the structure, we shall not take time to examine the charming details of the ornamentation of it, but shall simply advise you to raise your head and observe above the porch and immediately above an entablature supported by a row of heads, a Scotch fir that has succeeded in taking root upon this narrow space and in finding sustenance in the dust brought by the wind (Fig. 2). It owes its own origin to the wind, which deposited upon the entablature a seed of one of the trees, which are quite numerous in the vicinity.

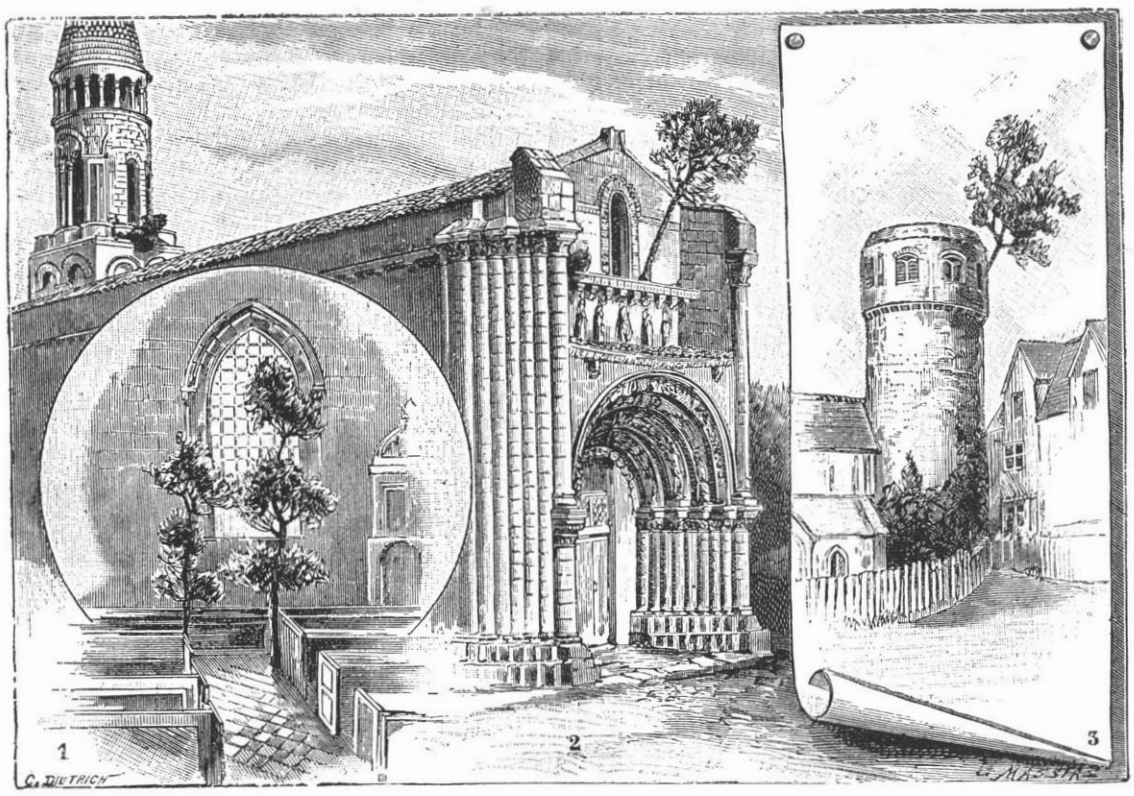

Fig. 1.—Trees growing in a church of Herefordshire in England. Fig. 2.—Tree on the church of Fenioux.
Fig. 3.—Tree on the Saint Benedict tower at Norwich.

It is probable that France possesses other examples of such odd growths as these, but we shall mention some that occur upon English edifices. In the city of Norwich, the church of St. Benedict is provided with a round tower having a series of windows at the top. From one of these issues a tree that rises several yards above the platform of the tower, and which is growing very vigorously (Fig. 3). At Bicknoller, in Somersetsbire, upon a tower of the church, there grows an evergreen oak which has already reached a height of five feet. It is well known and is much wondered at by tourists who visit the west of England. There may be observed, too, a sycamore which has been growing for more than half a century upon the tower of the little parochial church of Saint Petrochius, at Clanaborough, in North Devon. It has inserted its roots so deeply into the masonry as to threaten the solidity of the building. A few years ago the city of Stony Stratford possessed a plant curiosity of the same nature. In the wake of a great fire in 1742, one of the few structures that remained standing was the tower of the Saint Mary Magdalen church. A bird doubtless carried a seed to the summit of this, and there soon appeared a tree that buried its roots so deeply that it had to be pulled up in order to save the tower from falling in.

We are able, with our contemporary, *The Million*, to cite another church which is similarly situated. It is the parochial church of the village of Culmstock, in Devonshire. Here again there is an evergreen oak that has found a means of taking root at the top of the tower. To judge of it from its height and circumference, it must be at least two hundred years old. Its trunk is very straight and issues at an angle from the masonry, to which in days gone by some bird or the wind had brought an acorn from the evergreen oaks that grow in the neighboring cemetery. The oldest inhabitant of the village, who is eighty-eight years of age, says that in his childhood the tree had the same appearance that it has at present.

Finally, we shall mention a case that is still more curious, that of two trees growing in the interior of a church and through the pavement. This phenomenon is visible in the old church of Ross, in Herefordshire. These two trees grow near the pew occupied by John Kyrle, an inhabitant celebrated for the sums that he devoted to the planting of elms in his native city. A few years after his death, it became necessary to cut down several elms planted in front of the church, and two shoots were soon observed lifting the tiling of the church and increasing in size near the old pew in which Kyrle assisted in divine service. Since then the two trees have been allowed to continue their growth.—*La Nature.*

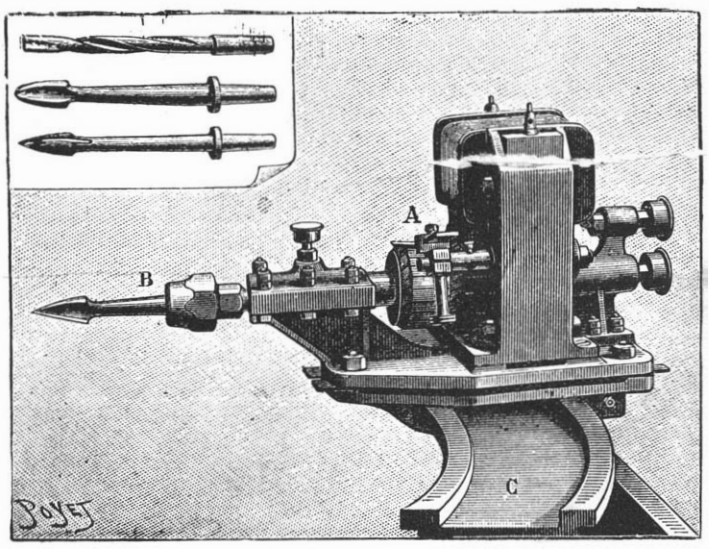

Fig. 2.—ELECTRIC DRILLING MACHINE.

AN AUTOMATIC SCULPTURING MACHINE.

We have recently had an opportunity of examining a new application of electricity that is worthy of being made known. It is a question of a sculpturing machine actuated electrically. This machine is evidently not designed to replace the hand of artists, but is valuable for making copies, and is capable, in a short time, of making rough-hewn statues, upon which the talent of the professional sculptor can afterward exercise itself usefully. The first idea of this application is due to Mr. Delin, a manufacturer of religious statues at Paris. It is he who conceived this arrangement and installed it practically in his studios.

The mechanism is of extreme simplicity, and includes the use of electric motors skillfully combined. Fig. 1 gives a general view of the apparatus in a studio. In the center there is arranged a vertical axis, provided with a carriage capable of moving throughout the entire length, thanks to a gearing and to the motion furnished by an electric motor placed at the upper part. The carriage in question, which may be seen in the center of the figure, carries two supports, that extend to the right and left in front of the statues. These supports are provided with slides, in which are placed the apparatus that serve for the work, viz., to the right the pantograph that the workman operates in front of the model and to the left the sculpturing machine. The two apparatus, with their supports, are capable of moving around the central axis, and every motion at the extremity of the one is reproduced at the extremity of the other, as in every pantograph. The two apparatus can be brought in front of the statues, as shown in our engraving. One of them, that to the right, is the statue that serves as a model and that it is a question of reproducing. The block to the left is the reproduction of it. In front of the model stands a workman, who, by means of a small apparatus placed upon the slide, holds a wooden rod designed to follow the exterior contours of the model at a distance of from one to two millimeters. The model is mounted upon a vertical axis and a rotary motion is communicated to it at the lower extremity through an endless screw. The same motion is transmitted to the second statue, which at the beginning is but a shapeless piece of wood. In the figure may be seen the endless screw, as well as the transmitting shaft, with the pulley and belt that actuates it.

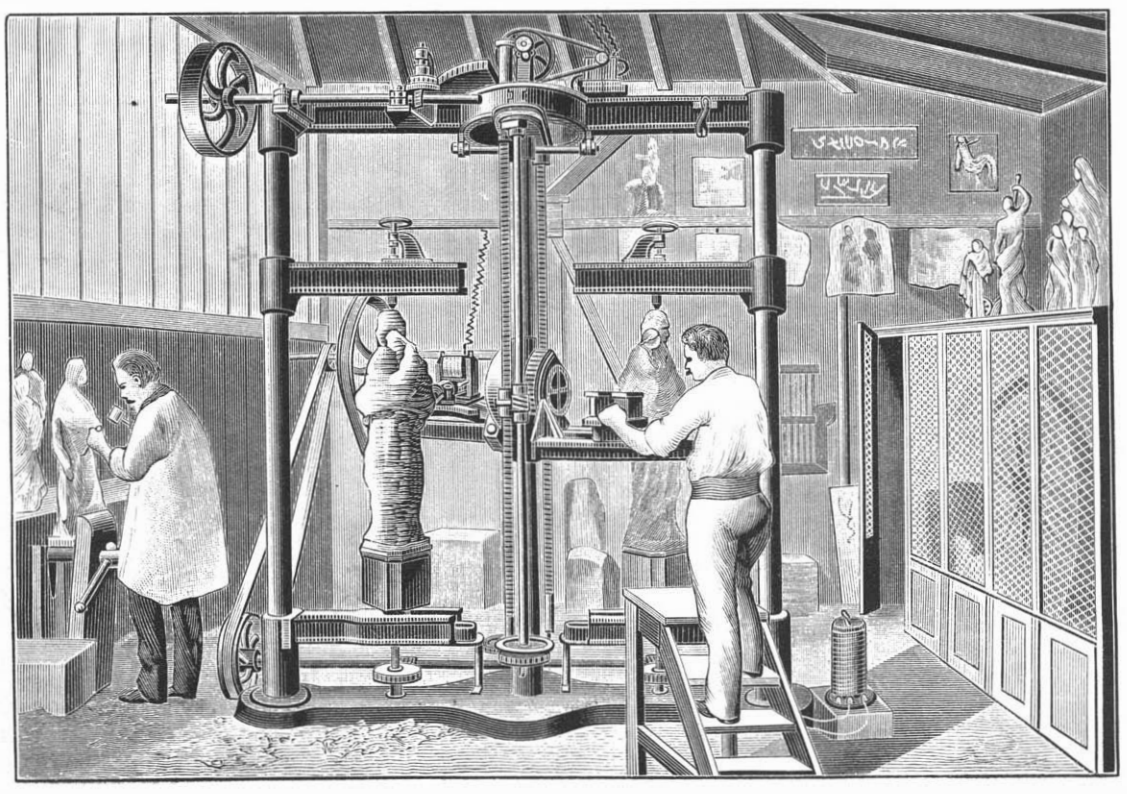

Fig. 1.—AUTOMATIC SCULPTURING MACHINE.

At the extremity of the second arm, to the left, is placed an electric drill, which is represented in Fig. 2. This motor is installed at C, upon a recurved part of the slide. It receives the electric energy at A, and sets in motion an auger bit, B, that revolves with great velocity. This bit may be replaced by others of various shapes, such as are shown in the upper left hand figure. When the machine is in operation, it suffices for the workman to bring the wooden rod near the model (an operation that he is performing in our figure), when the auger bit immediately approaches the piece of wood and cuts out a portion in such a way as to reproduce the model. The workman can likewise cause the carriage to rise or descend in order to effect the same work throughout the whole length of the statue.

This machine permits not only of accurately repro-

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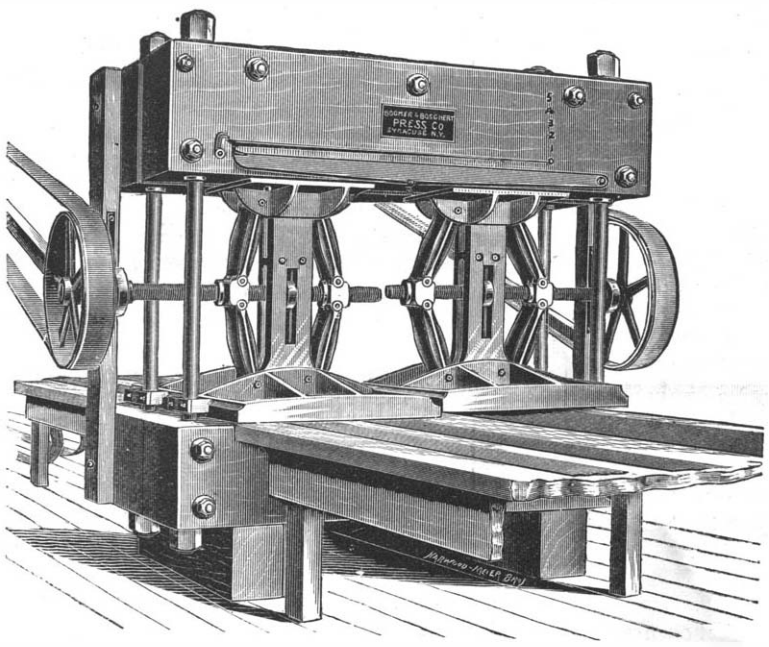
ducing statues to the same scale, but also of reducing or increasing at will the dimensions of a chosen model, through the aid of a few modifications in the respective positions of the counterpoints and of the bit, as well as in the different cog wheels of the gearings.

It has been possible to realize this application only through the facilities afforded by electric motors. As electric energy is not as yet distributed upon the left bank at Paris, recourse has been had to a Niel gas motor of 4 horse power, which actuates a Rechniewski dynamo, giving 70 volts and 45 amperes at an angular velocity of 1,800 revolutions per minute. This dynamo, in its turn, distributes the electric energy to the three motors whose different functions we have already mentioned, viz., to the electric drill, which consumes 70 volts and 30 amperes at an angular velocity of 7,000 revolutions per minute, to the motor that sets the statues in motion (70 volts and 6 amperes), and to the motor that moves the carriage vertically (70 volts and 9 amperes).

This sculpturing machine, which has been established for several months in Mr. Delin's studios, has, up to the present, given satisfactory results. Aside from the saving in time that it effects, it permits of very easily rough-hewing the pieces of wood, sketching the contours, and of having exact relative positions. The statue, thus-rough hewn in all its parts, is put into the hands of a skilled workman, who finishes it, and, when it comes from his hands, it leaves nothing more to be desired.—*La Nature.*

A DOUBLE BELTING PRESS.

There are many manufacturers of leather belting who have limited capital who, when called upon for an estimate of the cost of a wide belt, are unable to give it, because of the expense of putting in a large press, which must necessarily stand idle much of the time or be used on work which could be done on a smaller press to better advantage. To such the accompanying illustration and description will prove interesting. The press consists of one frame having the working parts of two presses. so that two belts of one-half the width of the press, or less, can be made at the same time and each operator be entirely independent of the other, while for wider belts both presses are used together, thus making a belt of the full width of the press; or the presses can be used to advantage by one press making two narrow belts, while in the other a wider one is being made. When a wide belt is made a steel plate is provided to fasten on the platen, thus obviating any danger of a crease where the two platens join. The manufacturers of this press, the Boomer & Boschert Press Co., Syracuse, N. Y., are well known, and some of the largest belts in this country have been made on their presses. The same firm also make a large line of presses for other purposes, using either the knuckle joint, screw or hydraulic principles, according to the work to be performed.



BOOMER & BOSCHERT'S DOUBLE BELTING PRESS.

A New Automatic System of Lighting and Extinguishing Street Gas Lamps.

Each lamp is supplied with two sal ammoniac batteries and a spark coil, placed in an iron box buried in the ground at the foot of the post. In the lantern is a miniature gasholder of about two cubic inches capacity, pivoted on a hinge and held down by weights; and directly over this holder is an automatic gas lighter, similar to those used in houses, only much simpler, larger and stronger. Two wires, about ten feet long, connect the lighter with the batteries through the post. Such an installation is under complete control from the gas works.

When it is desired to light the lamps of a city, it is only necessary to open the valve connecting one of the large gasholders at the works direct with the gas mains. This results in a decided increase of pressure in the gas all over the city, sufficient to cause all the little gasholders in the lamp posts to lift up about one-eighth of an inch against a platinum stop, and thus close the local battery circuit at each post. The automatic lighter being then supplied with current, immediately turns on and lights the gas. In a word, the system is merely a huge pneumatic push button, and corresponds precisely to pushing a button when desiring to light the gas in a house supplied with automatic lighters.

Fifteen seconds is sufficient for maintaining this increased pressure, to give time to make the increase everywhere felt. It can then he brought back to normal pressure, when the pressure gauge will drop back and open the electric circuit. This operation, if repeated, will extinguish the lamps.

The mechanism of the lighter is extremely simple, and made so strong as to insure it from getting out of order or requiring attention of any kind.

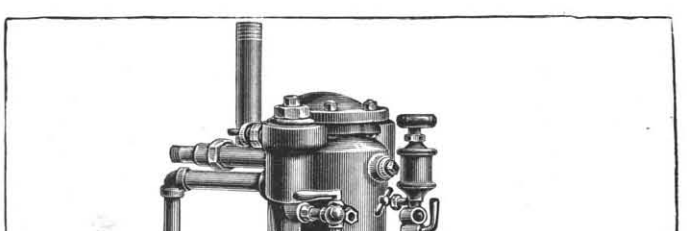
Hypnotism in Disease.

The chief arguments used against the employment of hypnotism in disease are, first, that it subordinates and enervates the will; second, that it renders the patient liable to be influenced by persons of evil intent; and, third, that only nervous or hysterical persons are subject to its influence. My own experience is that it may be used without injurious effects, and, also, that it may take the place of narcotics in a large number of cases in which they are now used. I have myself used it with advantage in delirium, in insanity, and in chronic alcoholism. I have successfully treated one case of kleptomania and two cases of excessive irritability of temper. At the same time hypnotism is a two-edged sword. Wielded by an unskilled hand, it may cut both ways deep into the faculties of intellection and into the nervous system generally. Also, it should never be used save by a skilled hand upon patients of an unbalanced mind accompanied by what is known in medical parlance as *paranoia*. In my treatment of a perfectly healthy, calm, intelligent, unimaginative man, whom I operated on fifty-one times, I found that the diapason of his whole mental and emotional system would give forth concordant sensations of pleasure, or discordant sensations of pain, at the will of the operator.

Summing up, I would say that hypnotism, as with every other new remedy, there is great danger that, on the one hand, it may be used indiscriminately, or, on the other hand, be scouted by a senseless skepticism. It has, beyond doubt, its definite limits of usefulness, and the medical man of the present day, realizing the futility of many of the old methods of treating disease, should keep his mind open to the reception of every new discovery.—*James R. Cooke, M.D., in the Arena, Boston.*

AN IMPROVED GAS ENGINE.

The gas engine shown in the illustration affords a notable example of the excellence to which this class of motor is brought at the present day. It was but a few years ago that the gas engine was but little better than a toy; noisy and expensive in its operation and with but little promise of ever becoming a rival of the steam engine. Now, however, their action (in the best makes) is smooth and regular and their economy compares favorably with that of the steam engine. The Olin gas engines present many points of excellence. They are strong and simple in construction. Every part is easily and almost instantly accessible. The charge is ignited by an electric spark, making them very safe, cleanly and free from odor. The governing is accomplished by a simple shaft governor, which has been found by careful test to easily control the speed with a variation of but 2 per cent from full load to no load. This sensitiveness, together with its positive igniting mechanism, makes the engine especially adapted for running dynamos for electric lighting. The lubrication is thoroughly automatic. The valves are of the poppet style and require no lubricant. These engines are being built in sizes from ¼ to 25 horse power. One design of these engines, made especially for driving coffee mills or other light work, is remarkable for its compactness and power. They take up a floor space of only 14 by 16 inches, are 23 inches high and use but 15 feet of manufactured gas per hour. These small engines are also built combined with pumps and are used for pumping water in high buildings, flats, etc. They will raise 400 gallons of water per hour 50 feet, with a consumption of 15 feet of gas. Where desired, any of these engines may be fitted with a gasoline attachment, adapting them for places where gas is not available. They are manufactured by the Olin Gas Engine Co., 222 Chicago Street, Buffalo, N. Y.

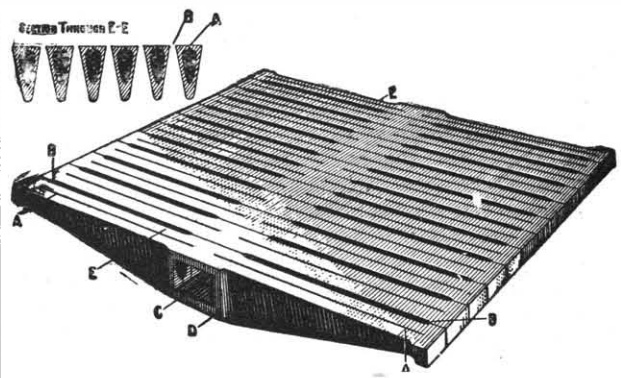


THE OLIN GAS ENGINE.

THE GADEY AIR GRATE.

This improved grate is made of hollow cast iron grate bars as shown in the sectional view.

In the top of each bar and running its entire length is a slot, A, A, about an eighth of an inch in width,



THE GADEY AIR GRATE.

through which a regular supply of air is delivered on the surface of the grate at the point of combustion. This supply of air is aided by the natural draught coming through the openings, B, B, between the bars. Through the center of the bars and across the entire furnace extends a supply chamber, C, to be kept continuously full of air by means of a small pressure blower. The side surfaces of each bar at the point, D, are planed so as to form an air-tight joint when the bars are placed together.

A one horse power blower will furnish sufficient air supply to boilers of 100 horse power or less. No alteration or reconstruction of either the fire box or chimney is required for the introduction of this improvement. The exact size and shape of the bars they are to replace are copied in making the patterns for the Gadey air grate.

It will be seen that this method of supplying air does not constitute forced draught, as commonly understood, because the natural draught admitted between the grate bars is employed in conjunction with the air blast through the hollow bars, thus enabling uniform and complete combustion to be maintained over the entire grate surface and increasing the capacity of any boiler where the improvement is introduced. It is especially advantageous in burning any small coal or screenings of coal, as well as such fuels as sawdust and mill waste from any kind of wood, bagasse from sugar cane and waste from cotton seed; in fact, any fuel requiring quick combustion to utilize it for steam purposes.

The constant circulation of air inside the bars tends to prevent clinker from adhering to the grate and also prevents the bars from being easily burned out.

This improved grate is patented and manufactured by Brown Bros. Manufacturing Company, Jackson and Clinton Streets, Chicago, Ill.

Boils.

Dr. E. L. Tiffany, of Princeton, N. J., in the *Eclectic Medical Journal* for December, considers the use of a fluid extract of barosma crenat., 3 j, in plenty of water, four times a day, to be a rapid cure for boils.

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Birds which Sing on the Nest.

BY MORRIS GIBBS, KALAMAZOO, MICH.

Among birds, the females do not sing, and althongh many species have musical call notes and agreeable tones in conversation, which are shared in by both sexes, still the true song is only rendered by the male bird. I am sincere in saying that the lady bird talks more than her mate about the house, but I will admit that when away from home she is very discreet in this respect. In attending to her duties of incubation she is very quiet, and it is seldom that a note is heard from her while on the nest. It has even been said that all birds are silent when incubating, so as to avoid observation. However, although most species are quiet when sitting, there are a few which chirp loudly when so engaged, and some even burst into exuberant song.

Few observers are aware how assiduous are the attentions of the two birds to one another during incubation, and the credit which is due to the father bird in his devotion in covering the eggs in his mate's absence is not allowed him.

Of course, when a bird is heard singing on the nest we know that the notes come from the male, but many young observers are inclined to attribute the song to the female. Another source of error in failing to identify the sex occurs with those species in which the singing male assumes the plumage of the female until the second or third year.

The chipping sparrow sometimes sings his chattering refrain while upon the eggs. Yellow warblers are not rarely heard singing from the nest, but one has to wait patiently in a neighboring copse, at the proper season, in order to hear, see and be convinced.

I have once heard the Maryland yellow-throat's song from its concealed nest in the grass: in fact, I found the nest, from hearing the peculiar notes, almost at my feet. Several times the song of the house wren has reached me, coming from the cavity where the old bird was sitting solacing himself in his gloomy nesting spot.

Once each I have heard the notes of the black-billed cuckoo, scarlet tanager, orchard oriole, goldfinch and the hermit thrush, the latter the only thrush whose song has positively reached me from the nest. One would think that the brown thrush, cat bird and robin, as great singers, would burst forth on the nest, but it must be borne in mind that these thrushes all prefer higher perches for singing, while the hermit is a ground nester and often sings on the ground.

But of all the species which are musical while sitting. the warbling vireo heads the list, both for persistence and for beauty of song, according to my note-book. Any one can listen to the song of the warbling vireo on the nest if the trouble to find a nest with eggs in May or June is taken. For when the mate takes his trick keeping the eggs warm, he cheers himself, and enlivens the surroundings by pouring forth his rippling, inspiring melodious warble. I have heard him sing from the nest in early morning, in the hottest part of the day, and in the early twilight, and I have heard him issue as many as twenty bursts of song during one spell on the nest, and have discovered the nest on more than one occasion by the sweetly modulated tell-tale song.

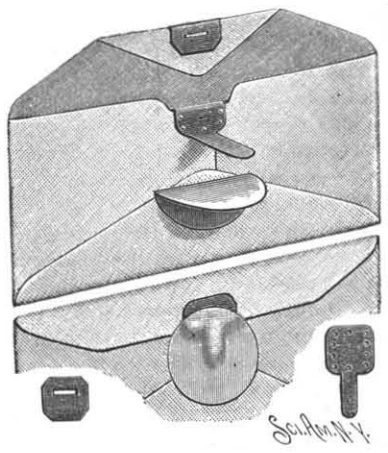
These ten species are all the birds which I have found to sing while on the nest.—*Science.*

Football.

Dr. Amidon, of New York, has taken the pains to make a list from the *Lancet's* reports of accidents that came to the notice of the editor in the year 1892. How many casualties escaped noticecannot be told. In this year 23 deaths occurred in England that were directly traceable to football. Those indirect ones that occurred subsequently or that will occur are left for future historians. Here is Dr. Amidon's little list of the English accidents requiring hospital treatment: Concussion of brain, 3; injury to the bead, 1; injury to the nose, 1; fracture of the nose, 1; fracture of the jaw, 1; fracture of the collar-bone, 20; dislocation of arm, 1; compound fracture of arm, 3; fracture of arm, 5; bad fracture of left arm, 2; serious injury to arm, 1; compound fracture of the elbow, 1; fracture of the left wrist, 1; fracture of ribs, 3; severe sprain of thigh muscles, 1; fracture of thigh, 3; injury to leg, 1; fracture of leg, 29; bad fracture of leg. 1; compound fracture of leg, 5; fracture of knee-cap, 1; severe injury to knee-cap, 2; fracture of ankle, 3; dislocation of ankle, 1; sprained ankle, muscles, and tendons severely wrenched, 1; severe injury to foot, 1; fracture of spine, 1; serious injury to spine, 1; serious injury in groin, 1; severe internal injuries, 2; severe internal injuries, fatal in two days, 1; fatal abdominal injuries, 6; undescribed accidents followed by death, 3; undescribed accident followed by lock-jaw and death, 1. Total number of grave injuries, 109. For the year 1893 the returns are not yet in. In the *Lancet* of November 18 there are recorded, as occurring during the preceding week, three cases of fractured leg; one of kick in abdomen, with death; one of concussion of spine; one of fractured clavicle; one of injury and death. This year, therefore, there have been at least twenty-eight deaths in England.—*Medical Record.*

AN IMPROVED FASTENING FOR ENVELOPES.

A durable fastener, permitting of the ready examination of the contents of an envelope, and yet well adapted to hold the envelope securely closed for filing away, is shown in the accompanying illustration, and forms the subject of a patent recently issued to Dr. George A. Harris, No. 301 North Laurel Street, Bridgeton, N. J. The improvement is applicable to any of the ordinary styles of envelope. At the junction or point of overlapping of the side flaps, a metallic re-enforce, or plate of thin perforated metal, is secured to the body of the envelope. The plate, shown in the small figure at the right, has at one edge an extension adapted to form a tongue, and is secured upon the envelope by being bent upon itself, the perforations aiding in retaining it in position. A metallic re-enforce, bent from a blank, as shown in the small figure at tbe left, is also attached to the flap of the envelope, and has an elongated slot adapted to receive the tongue, the envelope being then fastened by bending down the tongue. An adhesive flap is then secured over the fastening, or any other preferred form of seal may be employed, when the envelope cannot be opened without showing that it has been tampered with.



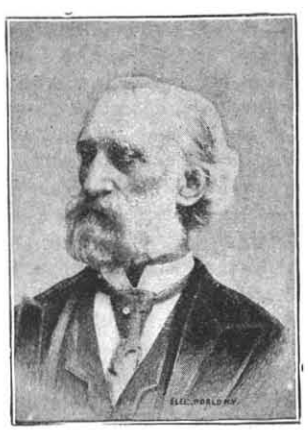
HARRIS' ENVELOPE FASTENING.

Snowflake Photography.

Mr. A. Sigson, a professional photographer at Rybinsk, contributes an account of his method of obtaining photographs of snowflakes to the *Journal of the Russian Physico-Chemical Society.* He used a Zeiss microscope provided with an aplanatic lens and a long focus camera. This was placed near an attic window at a strong inclination to the horizon. The flakes were received on some rough cloth and transferred to a small net of cocoon fibers stuck on a card perforated in the middle. This card was placed on the stage of the microscope, and the illumination was so arranged that half the field was uniformly illuminated and the other half shaded off. For an enlargement of fifteen times, the exposure lasted two to five seconds, with plates supplied by M. Lumiere. To avoid the melting of the flakes by the breath of the operator, the latter is obliged to breathe through a pipe bent backward during the adjustment of the apparatus.

HENRY GOEBEL.

On December 4, the death of Henry Goebel occurred in this city, of pneumonia. Henry Goebel was born in 1818, in the village of Springer, a small place not far from Hanover, Germany. He received a fair education in the branches commonly taught in the public schools. He early developed the tastes of a mechanic and a fondness for skillfully working out his ideas in a material form. He early learned the trade of a watchmaker and optician. In the early part of 1849 he landed in New York. He soon began to work on electrical devices and turned his attention to incandescent lamps, and in the early fifties, it is claimed, constructed lamps, first from cologne bottles and afterward from tube glass.



The hairpin lamp was the next form of lamp which be constructed, the leading-in wires being made of iron, platinum. or copper, or sometimes even of other metals. He also made numerous other lamps of the meat saw type from time to time, and during the period from 1860 to 1880 he gave away many lamps of his construction and exhibited many others to his friends. The story of his big telescope, which he exhibited in Union Square and elsewhere in New York City, and with which be used his incandescent lamps to attract customers, is too well known to need repetition here.

In 1881 Mr. Goebel became connected with the American Electric Light Company, and for some time made carbons for it. The reason Mr. Goebel gives why his lamps never came into practical or commercial use is the lack of a suitable source of current. He was obliged to rely upon primary batteries, which were both expensive and unsatisfactory. He did not hear of the application of the dynamo to electric lighting, he claims, until after his connection with the American Electric Light Company in 1881 or 1882, and it was about this time that he first heard of Edison and his work.

Mr. Goebel's connection with the recent incandescent lamp patent suits has so often been referred to and is so fresh in the minds of our readers that further comment seems unnecessary.—*Electrical World.*

Photographic Notes.

Removing Yellow, Green, Red, or Dichroic Fog.—Dr. Menlere, of Paris, advises the following treatment: Soak the negative in ordinary water for five minutes, and then immerse in—

Water	100 parts.
Bromide of sodium	3 "
Bromine water	3 "

Leave in for ten or fifteen minutes. The bleached image is well washed and dried, and the image redeveloped with an amidol-sulphite developer.—*Br. Jour.*

The Blue Process.—The following process for producing cyanotypes on paper is recommended by Herr F. Veress, the well known photographer of Hungary, in the *Photo. Almanach f.* 1893. Two solutions should be prepared:

SOLUTION A.

Iron and ammonia citrate	5 grammes.
Ammonium ferrocyanide	2 "
Oxalic acid	1 gramme.
Distilled water	120 c. c.

SOLUTION B.

Ferricyanide of potassium	8 grammes.
Ammonium ferricyanide	2 "
Distilled water	120 c. c.

The two solutions are mixed and then filtered. Previously moistened glossy baryta paper is floated on the filtered solution for about four minutes, when it is dried at 89° F. The paper is then printed in the usual manner beneath a negative. The prints are washed in soft water, and then placed one by one in a mixture of 100 parts water and 1 part of hydrochloric acid. They are allowed to remain in it about five minutes, until the image has become quite pure. Finally, the prints are well washed in clean water.

To produce blue printson canvasand silk, the following process is given by the same author: 5 grammes of arrowroot are dissolved in 50 c. c. of water; 2 grammes of gelatine are dissolved in 50 c. c. of warm water; 300 c. c. of water, to which has been added 1 gramme of ordinary white sugar, 10 drops of glycerine, and 5 drops of a saturated solution of caustic potash, are boiled. and the arrowroot and gelatine solution added to it by constant stirring. The liquid is then filtered through flannel in a flat dish resting in a warm water bath. The fabric to be sensitized is placed on the liquid and allowed to float for from four to five minutes; it is then mounted on blotting paper, which is fastened to a drawing board and dried in a warm room. The fabric is sensitized and printed as described above, and it should be used soon, for it quickly loses its sensitiveness. Before fixing, the prints should be placed one by one between sheets of blotting paper. in order to avoid spots. Fixing is done, as above described, in water acidulated with hydrochloric acid.

How to Print on Marble.—Mr. Villon publishes the following process: Coat an unpolished plate of marble with the following solution: Benzine 500 parts, spirits of turpentine 500 parts, asphaltum 50 parts, pure wax 5 parts. When dry expose under a negative, which will take in sunshine about twenty minutes. Develop with spirits of turpentine or benzine. and wash in plenty of water. Now cover the plate where it is intended to be left white with an alcoholic solution of shellac, and immerse the same in any dye which is soluble in water. After a while, when enough of the coloring matter has entered the pores of the stone, it is taken out and polished. The effect is said to be very pretty.—*Photographisches Archiv.*

Thiosinamine as a Photo. Fixer.—Herr Valenta has experimented with thiosinamine as a fixing agent. He finds that silver chloride dissolves in a 1:10 solution of thiosinamine as easily as in hyposulphite, silver bromide dissolves less readily, and iodide scarcely at all. The new solvent, therefore, can only be employed for chloride papers.

Gelatine in Hot Weather.—If in hot weather the gelatine has a tendency to leave the support, *Der Amateur Photograph* recommends a preliminary immersion of the prints for five minutes in—

Potash alum	5 grammes.
Water	100 "

Wash and tone in—

Aluminum sulphocyanide	15 c. c.
Water	100 "
Gold chloride solution 1:10	10 "

Fixation and washing as usual. The aluminum sulphocyanide is a liquid.

Dr. A. Steinheil.—We have to announce the death, on the 4th ult., of Dr. Adolph Steinbeil, a member of the well known firm of opticians in Munich. He assumed the direction of the house in 1862, thus succeeding his father. Astronomical optics engaged his particular attention, while he will ever be associated in photographic history with the aplanats and antiplanats bearing his name.

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Correspondence.

Antiquity of the Solar Cautery.

To the Editor of the Scientific American:

In the SCIENTIFIC AMERICAN for December 9, 1893, is an article entitled "Solar Cautery as a Remedial Agent," also the statement that "the use of the solar cautery was the discovery of Augustus Barnes, of Southington, Conn., was patented by him May 28, 1867," etc. The sun's rays, concentrated by means of lenses, *i. e.*, "burning glasses," have been employed in surgery from the most remote ages of which we have trustworthy accounts to the present. Scattered through the history of surgery are many cases where the sun's rays have been used as a cautery.

The oldest medical work in my library is the "Dictionnaire de Medecine," published at Paris in 1834. In vol. 7, page 57, we read:

"Cauterization by the solar rays in a single focus, by means of a single or several lenses, is excessively painful and almost insupportable and ought to be abandoned. One of us, Mr. Marjoleu, saw at the Salpetriere a young girl who had been brought there as incurable. Her nose was nearly eaten off by a ringworm ulcer, which extended to both cheeks. This malady commenced with a small ringworm that some one had tried at different times to destroy by this manner of cauterization."

Here we have the solar cautery employed in one of the most noted hospitals on earth, and the case published in a well known medical work thirty-three years before the date of Barnes' patent and sixty-seven years before the publication of Dr. Thayer's paper. Further, the bibliography of this subject published extends back to Costiro's work, printed at Venice in 1595.

JOHN W. KALES, M.D.

Franklinville, N. Y., December 11, 1893.

Brief History of Petroleum.

BY A. C. BENEDICT, ASSISTANT STATE GEOLOGIST OF INDIANA.

A variety of liquids, variously known as coal oil, crude petroleum, earth oil, maltha, mineral tar, naphtha, steinoll, bitumen liquid, etc., and corresponding in the characters of inflammability and insolubility in water with the animal and vegetable oils, have long been known to occur in many parts of the earth.

The countries most famous for the occurrence of mineral oils are the United States, Russia, Burma, and the West Indies. They also occur in China, India, Italy, Germany, Switzerland, and in limited quantity in France and England.

Chemically, all the various products known as naphtha, petroleum, etc., are closely allied, as they consist mainly of oils of different density and volatility.

The earlier analyses of oils were crude, inasmuch as no further attempt at separating the substances they contained was made than merely heating the oil, cooling the vapors of distillation, and treating the product with sulphuric acid. This sufficed to show that the constituents of petroleum are compounds of hydrogen and carbon. It was not until a comparatively recent date that any advance was made in the chemistry of the hydrocarbons, but now we have a long list of articles of the utmost importance in the arts and sciences derived from the researches of the chemists in this direction.

The earliest analysis of petroleum I have been able to find a record of is that of Winterl, made in 1788, of a black, heavy-bodied petroleum from Hungary, which yielded a colorless oil, a yellow oil, and a buttery mass. The last was probably an impure paraffine. In 1817 the native naphtha of Miano, in the duchy of Parma, Italy, was used for lighting the streets of Genoa. This is probably the earliest use by a city of crude petroleum for lighting purposes. In an account published at that time it is described as being a transparent thin yellow liquid, lighter than water, with a strong, persistent smell.

Bitumens are found of all degrees of consistency and of many shades of color. The naphtha of Georgia, on the Caspian Sea, is as colorless as pure water, while the asphaltum from the island of Trinidad is a black semi-solid body called the "bitumen lake." The light, clear oils consist almost wholly of carbon and hydrogen, while the heavier, darker and more solid varieties usually contain oxygen, and frequently sulphur and its compounds, carbon and bituminized carbonaceous matter.

The well known odor of crude petroleum is nearly always due to bituminous matter, spoken of above, or to sulphur compounds, as sulphureted hydrogen. To the last is due the odor noticeable in the waters of many of the artesian wells.

From the colorless varieties we pass by imperceptible gradations through the heavier and darker varieties of petroleum to mineral tar or pitch, that is generally considered petroleum, in which there is enough bituminous matter either dissolved or suspended to render it black and of a semi-fluid consistence. This mineral tar is intermediate between the light-bodied oils and the solid asphaltum.—*Clay Jour.*

Mummied Animals.

Not only did the ancient Egyptians embalm the bodies of the human dead, they performed a like operation upon the remains of the sacred animals, though in general less expense and trouble were taken over them, animals being chiefly prepared by soaking in natron. The list of sacred animals is a long one, though the very ones that were most highly esteemed in some places were most abhorred in others. The list includes dogs, cats, monkeys, lions, wolves, jackals, foxes, hyenas, bears, ichneumons, shrew mice, bulls, deer, goats, sheep, hippopotami, vultures, eagles, falcons, hawks, owls, ibis, geese, swallows, crocodiles, toads, lizards, serpents, fish of various kinds, rats, mice, beetles and even insects and flies. As a rule, with the large animals, the head only was mummied, the body being represented by pieces of wood. The birds are squeezed together and lose their shape, except the ibis, which, according to Belzoni, is formed like a fowl ready to be cooked. The ibis and the hawk appear to have had the most care bestowed upon them, for resin and asphalt are frequently found within their envelopes. Birds in general, having been wrapped in their bandages, were then placed in an earthen urn and deposited in the tomb. No mummies of animals are to be met with in the tombs of the higher class persons; most of them had their own proper sepulchers consecrated and appropriated to their species only, but they were occasionally found mixed.

The catacomb of birds is distinct from the catacomb of human mummies. One bird only is inclosed in each earthen pot, and an infinite number of pots were found in good order, whole and sealed; the hot nature of the materials with which they had been embalmed had, however, dried up the greater number to powder. Upon the possession of Egypt by the French, upward of five hundred mummies of the ibis alone were discovered in the catacomb of birds. Certain animals were maintained at the public expense in sacred parks, and persons were appointed to nourish them with the greatest care. Bread, milk, honey, meat, birds, fish, etc., were all supplied, according to the nature of the animals. No expense was spared: the keepers bore upon their persons the resemblance of the species to which their care was devoted, and people paid marks of respect to them as they passed along. The greatest sorrow was manifested at the death of any of them; they were embalmed and interred with great pomp and splendor. So great was the veneration in which these animals were held, that though when a famine afflicted Egypt the people were driven to eat human flesh, yet the sacred beasts, birds, reptiles or fishes were always respected; they would rather eat their own species than lay sacrilegious hands upon what might be gods in disguise. Animals of the lowest character, even noxious insects, were fostered in their temples, nourished by their priests, embalmed after death, entombed with pomp and received all kinds of honors. Those who, either by accident or design, occasioned the death of any of these animals, paid the forfeit of their lives as the penalty of the offense. Diodorus Siculus says: "He who has voluntarily killed a consecrated animal is punished with death; but if any one has even involuntarily killed a cat or an ibis, it is impossible for him to escape capital punishment; the mob drags him to it, treating him with every cruelty and sometimes without waiting for judgment to be passed."

If a cat died, the owner of the house shaved off his eyebrows; but if a dog died, he shaved his whole head, which would appear to denote that dogs were held in greater veneration than cats. In either case the greatest grief was shown, the people beating themselves on the breast and uttering doleful cries. The animal was then delivered to the embalmer to be prepared and deposited in the proper tomb. The cat was principally worshiped at Bubastis. Most of the cats that died in Egypt were embalmed and buried there. In the desert valley near to Beni-Hassan is a small temple excavated in a rock and dedicated to the goddess Bubastis, surrounded by different tombs for sacred cats, some cut in the rock. Before the temple, under the sand, there was found a large mound of mummies of cats folded in mats and mixed with those of dogs; and further on in the desert plain were two large collections of mummies of cats in packets and covered with ten feet of sand. One tomb was filled with cats carefully folded in red and white linen, the heads covered by masks representing the cat, and made of the same linen.

There have been more mummies of the ibis found in Egypt than of any other bird or animal, but very few in a perfect state. At Memphis there are thousands of them in pots of common stone or blue ware, or of hard polished stone of a lengthened conical figure; even the eggs of the ibis have been found preserved. Hardly ever have mummied animals been discovered in the human tombs, and never by any chance were amulets put with animals. Crocodiles were embalmed and deposited in catacombs purposely excavated for them. The small ones were bandaged entire, but when they attained any size only the head was embalmed, the remainder of the animal being represented by stalks of palm trees, bandages, etc. In the caves of Maabdeh, however, entire mummied crocodiles of the largest size have been found perfectly preserved. Generally five or six serpents were inclosed in one envelope. In some instances the bandaging was very carefully done, and the cloth was of a red color in addition to the usual yellow-stained linen. In addition to these, numerous small fishes have been discovered, and yet smaller insects, all carefully embalmed and deposited in the several tombs prepared to receive them. In many cases the animals were placed in mummy pots, in others simply bandaged and laid in the pits, and in only a few instances have they been put in cases like the human mummies. These latter receptacles are of different kinds and shapes. The first, or cartonnage case, is composed of folds of linen cemented together and plastered with lime on the inside. They are as firm as a board, and required to be sawed through in order to get at the body. The shape corresponds to that of the human frame. On the head is represented a face, either male or female, and the features are often depicted in gold and colors. Some of these cases are very handsome, the colors with which they are decorated having retained their freshness and beauty in a most surprising manner. Red, blue, yellow, green, white and black are the colors to be found on the cases and on the walls of the tombs.—*London Society.*

Cure for Naupathia or Sea Sickness.

In a recent issue of the N. Y. *Medical Journal*, Dr. W. W. Skinner, who has had long experience as a ship's surgeon, describes a method of treating sea sickness which he has found, in most cases, to be reliable and successful.

The dose by subcutaneous injection in a well developed case of naupathia should be for adults from a half to one milligramme of atropine and one milligramme of strychnine dissolved in mint water. The following is the formula:

Atropin. sulphat.	0·02 gramme.
Strychnin. sulphat.	0·04 gramme.
Aquæ menth. pip.	40·00 grammes.

One gramme, or one cubic centimeter, of this solution contains half a milligramme of atropine and one milligramme of strychnine.

Dr. Skinner says:

The effects of this medication are often surprising. In the majority of simple cases of sea sickness the patients cease vomiting at once after having received a single injection of one cubic centimeter of the above solution. Soon afterward they feel no more nausea, cephalalgia, or distress. Only a few minutes are required for this result to be obtained. Occasionally two injections are necessary to produce complete euphoria.

Everybody knows what a pitiful spectacle a really very sea sick person presents. He is painfully seated near the ship's rail or a basin or is lying down, caring not how or where, so long as he can vomit easily; he is pale, apathetic, vomiting, and suffering from headache and vertigo. But the injection of these alkaloids transforms this person in a little while. He ceases to groan, the vomiting stops, color returns to his cheek, and he affirms that he is "much better," or that he does not suffer any more at all. If the injection is given during the day time, he almost always falls asleep for half an hour or longer; if given in the evening, when the patient has retired for the night, the sleep is calm, prolonged, and restoring—so much so that when the physician visits his patients on the following morning he hears them assert with satisfaction that "the night was passed very well." This means a great deal to a person who has been kept awake a night or more by sea sickness.

What is it that we mean by the cure of sea sickness? Do we mean that as soon as the remedies are given the vomiting patient gets right out of bed and promenades the deck as gayly as if in a ball room? By no means. There is no power in the universe that could produce that result while the sea is still rolling high. But we do mean that the vomiting and even the nausea stop, that the splitting headache stops, that the patient is comfortable, that he or she generally falls asleep a little while, and that soon afterward food is relished and retained. The patient may still remain in bed, but he is not sea sick, and it is not necessary to wait for still water before this result can be obtained. Can more than this, or as much as this, be said of any other method of treatment of sea sickness?

Let it suffice to say, in conclusion, that the judicious employment of this method never does any serious harm; that it may very rarely be inoperative, owing to some cardiac, vascular, or nervous lesion; but that in simple naupathia it always produces amelioration and generally a cure of this affection.

FACSIMILES of types used in writing in the various foreign languages on the improved Hall Typewriter constitute a neat little double leaflet just published by the National Typewriter Company, of Boston, Mass. It includes several styles of type for correspondence in German, Russian, French and Spanish, besides Italian, Portuguese, Bulgarian, Servian, Bohemian, Danish, Swedish, Armenian, Hungarian, Roumanian and Hebrew, etc.

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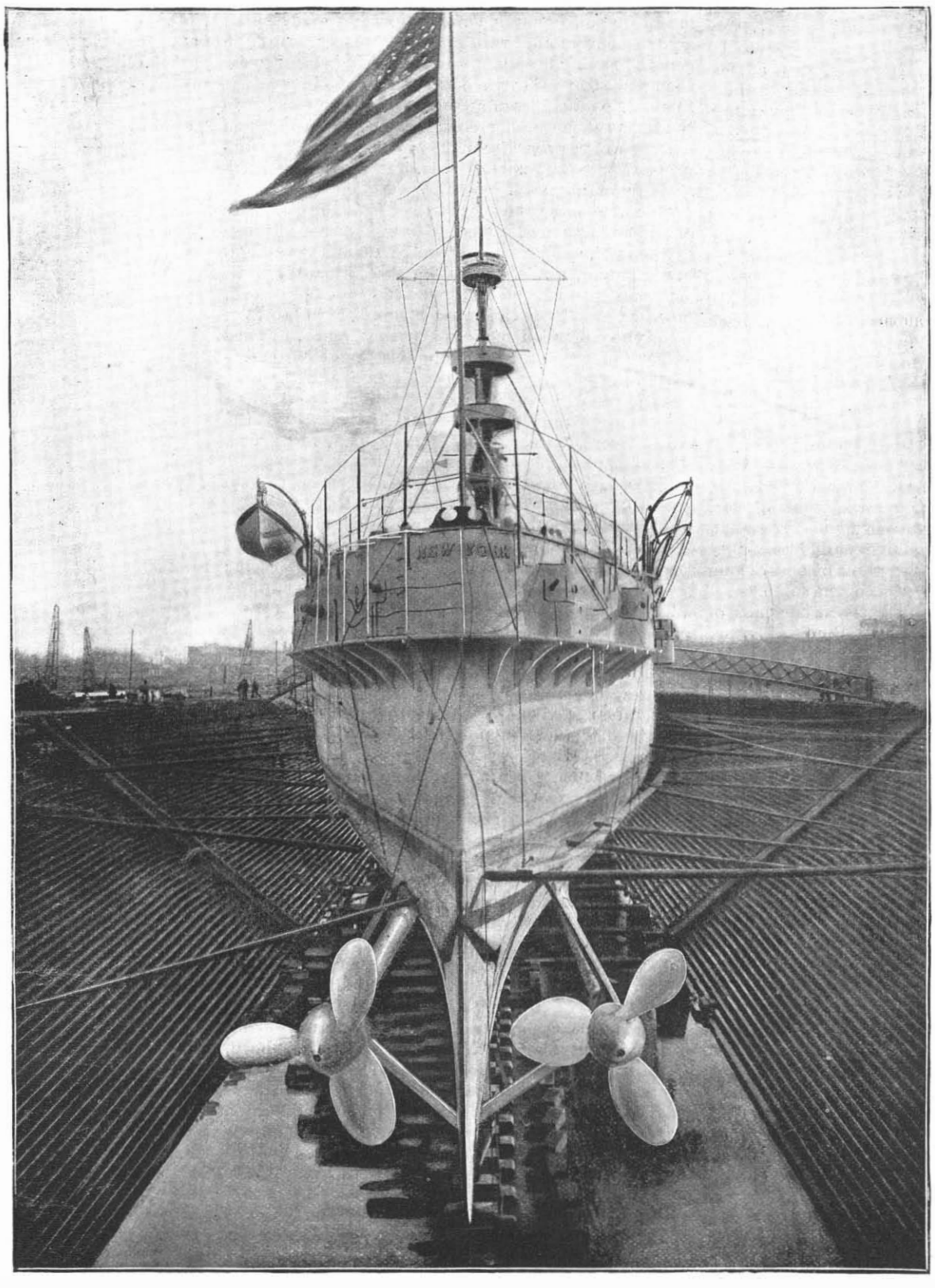
THE CRUISER NEW YORK IN DRY DOCK.

The first actual service of our big new armored cruiser New York was to be sent to Brazil, and she steamed away from New York for Rio Janeiro on December 26. The decision to send her there was apparently made with some precipitancy by the Navy Department, for the final docking and cleaning and painting of her hull, with the taking on of full supplies of coal and provisions, were effected with great expedition. It had been considered doubtful whether any dock in this country was large enough to take in the New York, which is 380 feet 6 inches long and 64 feet broad, with a mean draught of 23 feet 6 inches, and a displacement of over 8,000 tons. But with good management no difficulty was experienced in getting her into the fine new dry dock at the Brooklyn navy yard, although there was only about 14 inches on each side of the cruiser between her and the dock at the entrance. Our view is from a photograph. Her three-bladed propellers are of manganese bronze, 16 feet in diameter each and 20 feet pitch. When the cruiser had been floated into position in the dock her keel was about 10 inches above the blocks set to receive her, and she was drawing 25 feet 6 inches at the stern. As soon as she was wholly inside the dock, the caisson which forms its gate was towed into the entrance and filled with water until it sunk tightly into place, after which the cruiser was nicely centered over the keel blocks and shored. The sailors worked on floats to scrape and scrub the cruiser's sides as the pumps lowered the water, and, by night of the same day, the vessel had received its prime coat of anti-corrosive paint. This dries almost as soon as it is put on, and the bottom was ready the next morning for a coat of anti-fouling paint. The latter was put on hot, with wide brushes, and the job was finished during the day, so that on the next morning the vessel was ready to be floated from the dock, having been but little more than forty-eight hours out of the water.



THE U. S. WAR SHIP NEW YORK—STERN VIEW.

Peanuts as an Article of Food.

In the *Berliner klinische Wochenschrift* (cited in the *Centralblatt fur klinische Medicin*) Dr. P. Furbringer treats of the peanut as an article of food rich in albumen, of which it contains forty-seven per cent, together with nineteen per cent of fat and non-nitrogenous extractive matters. He recommends the use of roasted peanuts in the form of soup or mush. On account of their cheapness, peanuts are recommended as a popular article of food, especially in poor houses and the like; moreover, they are recommended as an article of food for the corpulent, for diabetics, and for the subjects of kidney disease, in the last mentioned of whom foods rich in animal albumen are to be avoided.

Minot's Ledge Lighthouse.

Work could be carried on only from April to September, the sea being too rough at other times to admit of the workmen gaining a footing on the ledge, or even of approaching it with safety. The first blow was struck Sunday morning, July 1, 1855. The building of Minot's Ledge Lighthouse was a work for humanity, and therefore Snnday, the first day the weather had been propitious for beginning operations, was utilized. The weather allowed of only one hundred and thirty working hours at the ledge that entire season. Preparing a partly submerged rock to receive the foundations of a granite tower is quite a different matter from digging a hole in the ground on shore. Guards in boats constantly plied around the ledge to pick up workmen who might be washed off into the sea, and their services were frequently required.

Not until July 9, 1857, could the first stone be laid. During that season there were again only one hundred and thirty working hours at the ledge. Anticipating such a contingency, Captain Alexander had picked out a force of good all-round workmen, so that when work had to be suspended on the ledge the *morale* of his force would be maintained by keeping the men occupied on shore in shaping the granite blocks for the tower, and fitting the courses on a model, so that no time would be lost in correcting errors after the blocks had been shipped to the ledge. As a matter of fact, work on the model disclosed several miscalculations which would have caused annoying delay had they not been discovered in time to be rectified on shore. The tower was completed September 16, 1860, in 1,102 hours and 21 minutes, at a cost of $300,000. In shape it is the frustum of a cone, one hundred and fourteen feet and one inch in height, including the lantern.—*Gustav Kobbe, in the Century.*

Europe Growing Colder.

That the continent of Europe is passing through a cold period has been pointed out by M. Flammarion, the French astronomer. During the past six years the mean temperature of Paris has been about two degrees below the normal, and Great Britain, Belgium, Spain, Italy, Austria, and Germany have also been growing cold. The change seems to have been in progress in France for a long time, the growth of the vine having been forced far southward since the thirteenth century; and a similar cooling has been observed as far away as Rio de Janeiro, where the annual temperature has been going down for some years past.

Luminous Paint.

Nearly every one has heard of luminous paint—the sulphide of calcium; but it is probable that comparatively few persons know much about the behavior of this interesting compound. When of good quality it is quite white, as seen by reflected light, but the light that is emitted by it in the dark immediately after exposure to the direct rays of the sun is quite blue, and the emitted light is of a lavender hue directly after subjection to the action of ordinary diffused daylight. Both of these colors, however, in a dark room rapidly fade into a white light that is more luminous. A greater luminosity is produced by a short and near exposure to an ordinary artificial light, or by being placed near a window about sunset on a rainy day. The direct rays of a bright, full moon falling on it for several minutes have very little effect, making it barely visible in a dark room. After ten seconds' exposure to good, diffused daylight, which is as effective as an exposure of ten honrs, this substance will give out a practical light for ten or twelve hours, and its luminosity will not entirely disappear in less than thirty hours. This great difference in the time required for the absorption and the emission of light is quite remarkable, and it makes it seem as if the light emited were many times greater than that absorbed.

When the luminous paint of poor quality is removed from light to darkness, the light emitted by it fades rapidly, and in a few minutes becomes of a dull reddish or smoky color, much like that of the moon during its total eclipse.

A temperatnre of 300 degrees to 400 degrees will not put calcium sulphide into a luminous condition, though, after exposure to light, an increase in temperature of 25 degrees will make it much more luminous. That this is not a conversion of heat into light is shown by the fact that if kept at a high temperature it will become non-luminous in a shorter time. As might be expected, a lowering of temperature by ether or other volatile liquid will diminish the luminosity.

This luminous condition is not conveyed from particle to particle, like heat. If a quantity of the dry powder be exposed to the light all day, on breaking through the surface the interior will be found to be non-luminous, the light having affected the outer portion to the depth of perhaps a sixty-fourth of an inch. If a bottle, partly filled with the dry powder, be revolved in the light until the whole mass has become luminous, and then be set away in the dark, the interior loses its light as rapidly as the surface, but in doing so does not help the surface to glow any longer or more brightly. What becomes of the interior? Does it change into heat? Perhaps some physicist, with facilities for delicate measurements, can answer these questions. This non-conductivity of light admits of the production of some impressive effects. If the hand, with fingers spread, be held against the flat surface of luminous paint while exposed to the light, a black hand on a luminous field will be seen. If, however, the painted surface, while acted on by light, be well covered by a card having an opening the size and form of a hand, and then moved about in a dark room, nothing will be seen but a white, floating specter hand. Forms of various articles may be thus shown; but perhaps the most pleasing effect is produced by a piece of lace drawn tightly over the paint while in the light. The luminous property of this substance is known to have remained unimpaired for more than five years.—*The Pharmaceutical Era.*

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TECTORIUM, SUBSTITUTE FOR WINDOW GLASS.

We have already described the manufacture of a sheet glass in which wire gauze is incorporated. For some years, a product of the same nature has been manufactured, in which the glass is replaced by a special insoluble bichromated gelatine as translucent as opal glass and incorporated in the wire gauze. Fig. 1 shows the aspect of it. This product designated as *tectorium*, has, for some little time, been widely used. We believe it of interest to make this curious substitute for window glass known to our readers and to point out its useful qualities.

It has been employed for many years in Austria, Italy, Germany, Switzerland and Russia as a covering for hothouses, marquises, verandas, roofs of stores, windows of factories, etc. It refracts the rays of the sun, and, while possessing the translucency of opal glass, is tough and flexible, bends without breaking, is not injured by frost, and does not dissolve in water. It is a bad conductor of heat, and, when exposed to the air, becomes stronger and stronger.

Upon passing a slight coat of paint of oil color over the tectorium, one obtains an imitation of stained glass difficult to distinguish from the genuine article. It is easily cut with shears and may be given any form that is desired.

To properly utilize tectorium, it is necessary to nail it to the wood of the window like ordinary glass. When it is a question of employing it upon iron, it is necessary to first cover the latter with small laths and fix the tectorium to them with nails (large-headed ones by preference) somewhat distant from the edge of the material.

Tectorium is easily repaired, provided that the damage is not too great. For small holes the wire of the gauze is first put in place, and a special lac prepared for the purpose is then inserted. If, on the contrary, the rent is too large, it is better to cut out the broken part, and, by means of thick lac, fix a piece of tectorium over the hole.

Some manufacturers who employ the material with success assert that it is not only a very curious substitute for glass, but that it may be considered as much cheaper, owing to the long time that it lasts, its resistance to breakage, etc. It is manufactured in pieces 23 feet in length by 4 in width.

Employed for roofing buildings, hothouses, factories, etc., the tectorium, having to withstand rain, snow, etc., must be firmly and carefully fixed to the T irons that generally compose the framework of such coverings. One of the best means of obtaining a good result consists in cutting the squares or strips three-quarters of an inch wider than the frame on every side, and folding the edges upon themselves so as to double them. After piercing the T iron, one puts in place the tectorium, in which apertures are formed opposite those of the frame. Afterward a small strip of wood being applied to the doubled edge, it is fixed by screws or rivets in such a way that the sheet shall be firmly compressed between the wood and the iron (Fig. 2). —*La Nature.*

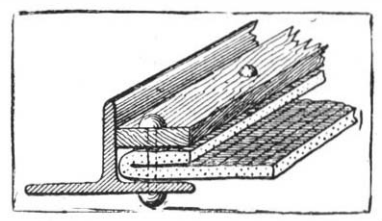


Fig. 2.—MOUNTING OF TECTORIUM.

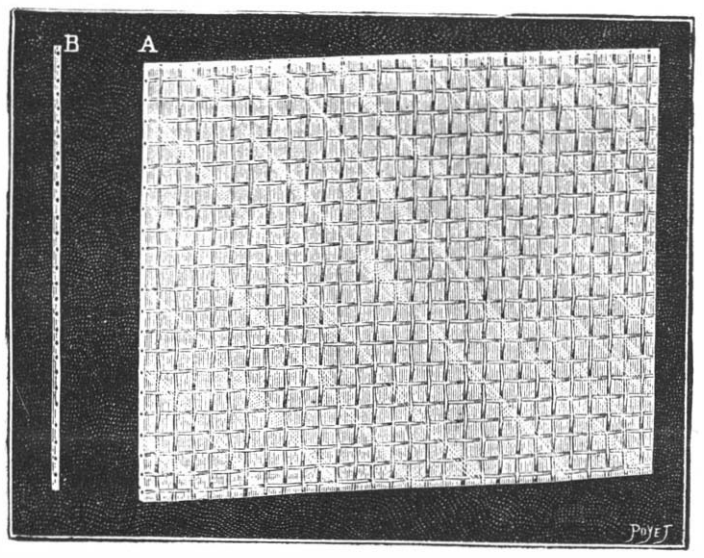


Fig. 1.—SHEET OF TECTORIUM.
A.—Face View. B.—Section.

Artificial Diamonds

To obtain the pressure which he judged requisite to the formation of the diamond, M. Moissan conceived the idea of utilizing the property that certain bodies possess of increasing their volume when cooling from a liquid to a solid state. He placed silver and charcoal of sugar in an electric furnace and fused the metal to a state of ebullition; a certain quantity of carbon was thus absorbed by the metal. The mass was then thrown into water, and at once formed a shell of solid silver. When this was withdrawn from the water and allowed to cool slowly, the pressure of the kernel of molten silver contained in the exterior shell, which expanded in the process of cooling, precipitated the carbon in the form of microscopic black diamonds.

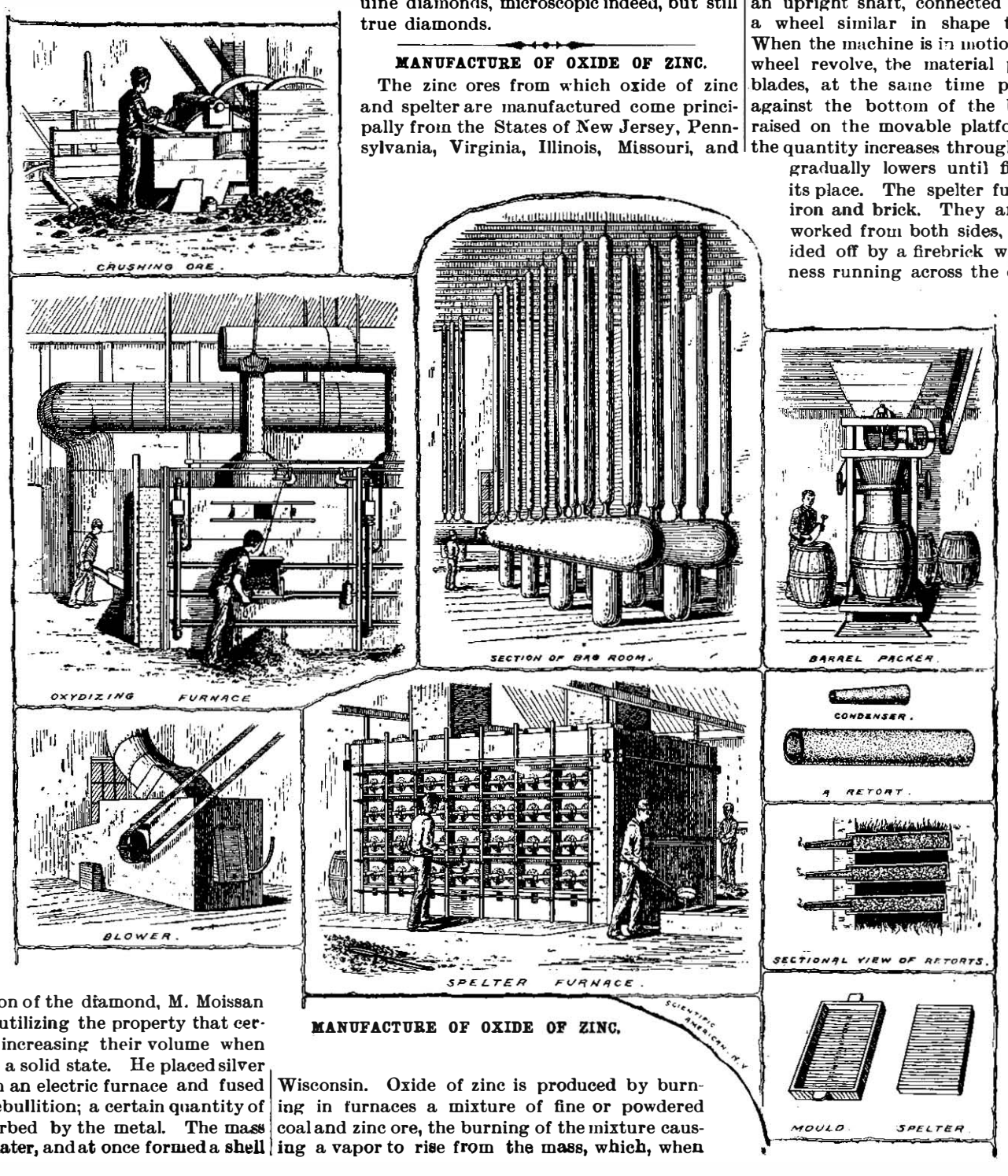
Following this experiment, M. Moissan inclosed in a cylinder of soft iron a certain quantity of charcoal of sugar, and plunged it into a bath of liquid iron, placed in an electric furnace. Withdrawing the crucible from the furnace, he plunged it in water and allowed the mass, as soon as the exterior shell was formed, to cool gradually. The result was the production of genuine diamonds, microscopic indeed, but still true diamonds.

MANUFACTURE OF OXIDE OF ZINC.

The zinc ores from which oxide of zinc and spelter are manufactured come principally from the States of New Jersey, Pennsylvania, Virginia, Illinois, Missouri, and Wisconsin. Oxide of zinc is produced by burning in furnaces a mixture of fine or powdered coal and zinc ore, the burning of the mixture causing a vapor to rise from the mass, which, when coming in contact with the air, forms itself into a white powder.

Spelter is produced by burning the mixture in air-tight retorts, the material in which vaporizes and forms itself into liquid zinc. The oxidizing furnaces are made of iron and brick, the inside of which is lined with fire brick. The burning spaces are about 6 feet in length, 4 feet in height, and about 4 feet in width. A charge—of which there are six daily—consists of about 400 lb. of fine coal and about 550 lb. of zinc ore crushed, which is moistened with water. When the furnace is ready to receive the charge, the mixture is put into the oven. After burning about one-half hour, an upper door of the furnace is thrown open to let the gas escape and prevent explosion. As the heat from the burning mass increases, a vapor from the heated ore arises, which is carried off through an 18 inch pipe or chimney, by means of a blast underneath the bottom of the furnace. This blast admits the oxygen, which, coming in contact with the vapor, causes it to form itself into a white powder. Running horizontally and attached to the pipe at the top of the furnace is a 4 foot pipe, which connects itself by an underground passage to a blower, which carries or forces the powder up into what is called the bag room. The pipes from the blowers run across the center of the room, connected to which every few feet apart, on each side, are a number of muslin bags ranging in diameter from 1 to 4 feet. The small bags are suspended to the rafters 50 feet above and are connected at the bottom to the large 4 foot bags, which run horizontally each way across the room, underneath the bottom of which are a number of 2 foot teats. The oxide of zinc is blown from the pipes into these bags. After a quantity is collected, the blower is stopped and the bags collapse and are shaken by the attendant, causing the material to settle down into the teats, where they are emptied in common bags and then screened and bolted. After being bolted the material passes to the barrel packer. The material passes down through a hopper and into a metal cylinder about the length and the diameter of the top of the barrel. Running down through the center of this cylinder is an upright shaft, connected to the end of which is a wheel similar in shape to that of a propeller. When the machine is in motion the upright shaft and wheel revolve, the material passes out through the blades, at the same time pressing and packing it against the bottom of the barrel, which has been raised on the movable platform of the machine. As the quantity increases through the blades, the barrel gradually lowers until filled and another takes its place. The spelter furnaces are also made of iron and brick. They are square in shape and worked from both sides, the furnaces being divided off by a firebrick wall about 1 foot in thickness running across the center. The distillation is carried on in cylindrical fire clay retorts. These retorts are about 5 feet in length and about 1 foot in diameter and 1⅛ inches in thickness. There are 56 of these retorts on each side, placed in rows, so that they can be encircled by the fire and heat, the inner ends resting on projecting shelves in the center wall and placed so that the inner ends are a little higher than the other.

When the retorts are all in position they are filled with a mixture of fine coal and ore, the attendants putting the material in by means of semi-cylindrical shovels, the operation taking about 3 hours, each retort holding about 125 pounds. After the retorts have been filled conical-shaped tubes or pipes of fire clay are plastered in the mouths of the retorts and the fires started. These conical tubes or condensers are about 18



MANUFACTURE OF OXIDE OF ZINC.

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inches in length, about 5 inches in diameter at the base and taper down to about 3 inches at the mouth. As the temperature increases, small jets of flame of different colors issue from the mouth of the condensers; when it becomes a dazzling white it shows that the material is vaporizing and forming into liquid zinc, which begins running into the condensers. The condensers are drawn every 24 hours, the attendants emptying them by means of long iron rods ladle-shaped on the ends. These are drawn back and forth drawing out the liquid zinc which runs into iron receptacles held by the attendants. They are then taken away and moulded into 40 pound cakes of spelter. The retorts last from 2 to 6 weeks, the upper ones lasting the longest on account of their not being close to the fire. The production of spelter in net tons amounts to about 40,000 tons yearly. The sketches were taken from the manufactory of the Passaic Zinc Company, Jersey City, N. J.

Law Governing Sales of Merchandise.

Mutual Assent.—The parties must agree to the same thing at the same time to make a valid sale or contract.

Assent need not be in writing, but may be verbal, by signs or by the conduct of the parties. Even silence often gives consent, as where a man takes up another man's goods and walks off with them. In such case, he agrees to buy the goods and pay their marked value in cash, when demanded.

The fall of the auctioneer's hammer implies consent of both seller and buyer to the bid.

Performance of an offer or proposed agreement constitutes assent.

A mere offer or proposal does not constitute a sale; but if it be accepted, the sale is complete.

(1.) *Offers* must be complete and definite, leaving nothing to be settled by future arrangements, otherwise they are mere proposals to enter into an agreement to sell.

Naming the price of goods and nothing more does not constitute an offer to sell, to the person inquiring, at that price. A letter, stating that the senders were "authorized to offer" goods on certain terms, if accepted, will not bind the seller for any amount the buyer might see fit to order.

An order is usually an acceptance of a previous offer, but often it is merely an offer from the buyer, and if the order is accepted and filled by the seller, the sale is complete.

An offer, unless limited to a certain time, will continue good for a reasonable length of time, according to the circumstances and usages of the trade. If not accepted within a reasonable time, the offer is considered recalled.

An offer can be recalled at any time before it is accepted, and is revoked by the death or insanity of him who makes it.

(2.) Acceptance of an offer must correspond with the offer in its terms. If it does and the offer has not been recalled, the minds of the traders have met, there is an agreement, either to a present sale or to a future one.

If the offer is accepted a moment before it is recalled, the trade is binding. An offer cannot be recalled or accepted unless the acceptance or revocation be communicated to the other party in some manner. The one party may, in his mind, have decided to rescind his offer or to accept an offer; but mere intention is not sufficient to bind the other party. The intention must be followed up by action.

According to the decision of our courts, however, an acceptance to be binding does not have to come entirely to the party making the offer. *The acceptance is binding as soon as it is deposited in the post office properly or given to the telegraph operator.* And this is true, although the letter or telegram never reaches the party to whom it is sent. If the acceptance is mailed or telegram started before the withdrawal of the offer reaches the acceptor, although the withdrawal might have been mailed or telegraphed before the acceptance, the contract or sale is made and both parties will be bound.

The acceptance, if sent by letter, must be actually deposited in the post office. The fact that it was placed among other letters to be posted will not suffice.

An acceptance can be withdrawn at any time before or simultaneously with its receipt, by the party making the offer.

If the offer specifies when it will expire, or when acceptance must be made, or the manner of acceptance, the acceptance must be within the time and in the manner specified. If it is not, the offer is considered rejected.

An acceptance that varies the terms of the offer in any respect amounts to a complete rejection of the offer, and the party making the offer can consider his offer rejected.

If A offers to sell for 10 cents and B says he will accept the offer, price payable at 60 days, the offer is rejected, for unless it be customary in such dealings to give credit for 60 days, the offer is for 10 cents cash down.

If A offers at 10 o'clock to sell for 10 cents, and at 12 o'clock B tells him that he will accept the offer, but at the same time A says he will not sell for less than 12 cents, there is no sale. They failed to assent to the same thing at the same time.

(3.) Fraud in sales makes them voidable at the option of the party who is defrauded. If he chooses, he can hold the defrauding party to his contract. Such a sale is voidable because the parties failed to agree to the same thing. A offered damaged goods while B accepted an offer of sound goods.

(4.) *Mistake* as to the existence, indentity, species, or kind of goods, or as to the price to be paid, if it be material, will render the sale void. In such case they do not assent to the same thing.

In case such mistake occurred, the party mistaken or injured must rescind the sale by notice, or otherwise, as soon as the error has been discovered. If he delays beyond a reasonable time, his silence will be equivalent to confirmation of the sale.

Property that has ceased to exist cannot be sold, nor can property not yet in existence, or not yet owned by proposed vendor, but there may be an agreement to sell such property, that will bind the parties.

(5.) Valuable consideration.

To make a sale binding on the parties, there must be money paid down, or agreed to be paid for the goods. If goods are exchanged for goods, there is an exchange or barter, but it is not, strictly speaking, a sale.

When the parties deal honestly, the amount of the price has no effect on the validity of a sale, provided it be some amount, however small. But where there is a charge of fraud, a small price is evidence tending to prove fraud.

In a contract of any kind, a valuable and binding consideration is any benefit to the party promising, or to a third person at his request; or any injury, loss, charge, or inconvenience, or the risk of it to the party promised.—*Milling.*

The Function of Clothing.

DR. ROBSON ROOSE IN THE "FORTNIGHTLY REVIEW."

Wind carries off the layers of air in contact with the body, replaces them by colder air, and promotes evaporation, whereby the temperature is lowered to an almost indefinite extent. Every one knows the sensation caused by wind blowing on damp clothes or on the wet skin, and the intense cold thus experienced. To obviate this effect the wind must be prevented from reaching the surface of the body, and for this purpose skins and furs are the most efficient coverings. These constitute extremely warm clothing, and cannot be dispensed with in many parts of the world. It is perhaps well to repeat that these articles possess no warmth in themselves. When worn they prevent the natural heat of the body from being rapidly dissipated and neutralized by the external cold air. Next to these come thick, coarse, woolen fabrics which entangle and retain large volumes of air. These are especially suitable whenever great fluctuations of temperature have to be encountered. Besides the properties already mentioned, there is another peculiarity connected with wool which enhances its value as an article of clothing, viz., its power of absorbing water, which penetrates into the fibers themselves and causes them to swell, and also occupies the spaces between them. This property is a very important one as regards health. The normal skin gives off nearly a pint of water, in the form of perspiration, during twenty-four hours, and this fluid disappears by evaporation. The passage of liquid into vapor causes heat to become latent, and the bodily temperature is thus lowered, as may be clearly observed some little time after exertion. If dry woolen clothing be put on immediately after exercise, the vapor from the surface of the body is condensed in and upon the wool, and the heat which had become latent in the process of evaporation is again given off. Flannel clothes, therefore, put on during perspiration always feel warm, whereas cotton and linen articles allow the perspiration to pass through them, so that the evaporation and cooling processes are unchecked. There is, therefore, an obvious reason for selecting flannel clothing for wearing after active exertion. An individual who is perspiring freely is far less likely to take cold when clad in flannel than when clad in linen or cotton. Dr. Poore thinks that cotton might be made to acquire properties similar to those of wool by adopting a looser method of weaving the material. If linen or cotton be woven "in a loose, porous fashion, these fabrics then become, as heat retainers, scarcely inferior to wool." Woolen fabrics cause a sensation of warmth in virtue of another peculiarity which they possess. They often present a rough surface, which, coming into contact with the skin, causes friction, and therefore more or less warmth. The irritation thus produced is intolerable to some persons, but if it can be borne for a short time, the skin often gets accustomed to the sensation.

The color of the materials has some influence on the warmth of clothing. Black and blue absorb heat freely from without, but white and light shades of yellow, etc., are far less absorbent. This difference can be demonstrated by experiment; the same material, when dyed with different colors, will absorb different amounts of heat. In hot countries white coverings are universally worn, and sailors and others wear white clothing in hot weather. With regard, however, to heat given off from the body, the color of the materials used as clothing makes little, if any, difference. Red flannel is popularly supposed to be warm, though it is no better in this respect than similar materials of equal substance, but white or gray in color. Dark clothing is best for cold weather, because it more freely absorbs any heat that is obtainable. Waterproof clothing is very valuable under certain conditions. It protects against cold, rain and wind; but it is an exceedingly hot dress, for it prevents evaporation and condenses and retains the perspiration. Save for very short periods, it should never be worn by persons taking active exercise. For those, however, who are not exercising their limbs to any great extent, but are exposed to wet and cold, waterproof materials are an excellent protection. Woolen clothing should be worn underneath in order to absorb perspiration, and the waterproof should be taken off as soon as the necessity for it has passed away. Ventilating waterproofs are sometimes offered, but a real combination of this kind is an impossibility. If a garment let out air and perspiration, it will let in wind and wet. If thoroughly waterproof, it will not admit of any true ventilation.

With regard to woolen clothing as a protection against wet, it must be remembered that fabrics of this kind, especially if loosely woven, absorb an enormous amount of water. A man clad in thick woolen clothes, and walking in rain for some hours without other protection, is conscious of great weight and inconvenience. Under similar conditions cotton and linen garments are speedily saturated, and the wearer soon becomes chilled. Garments made of pure silk are exceedingly comfortable, but very expensive. Thin silk, worn under flannel, adds greatly to the protection afforded by the latter against chills, and likewise prevents the unpleasant sensation of friction. Thin flannel socks, worn under merino or woolen ones, form a good remedy for cold feet.

The principal conclusions to be drawn from the foregoing paragraphs may be thus briefly stated:

1. As a protection against cold, woolen garments of equal thicknesses are much superior to either linen or cotton, and should always be worn for underclothing. Furs and leather are serviceable against great cold, and especially against severe wind. Waterproof clothing should be reserved for very wet weather, and generally for persons who are not taking exercise when exposed to it.

2. The value of several layers of clothing as compared with a single warm garment should be borne in mind. An extra layer even of thin material next the skin is often very valuable.

3. As a protector against cold, a garment should not fit closely to the body, but should be comparatively loose and easy, so that a layer of air is interposed between it and the skin. A loosely woven material is warmer than one of an opposite character.

4. For wearing at night, woolen clothing is not generally desirable; cotton or linen is far better. The blankets constitute the woolen covering, and ought to protect the body sufficiently.

5. Lastly, it must always be remembered that the source of heat is within the body itself, and not in the clothes. Proper food, coupled with a due amount of exercise, will produce heat; the function of clothing is to retain the heat thus generated.

Effect of Temperature on Iron.

An official statement of tests made at the Massachusetts arsenal to ascertain the effect of temperature on the strength of iron has been published. The specimens were heated by rows of Bunsen burners, which were arranged in a muffle, and the temperatnres of the test specimens were judged by their observed expansions. Each piece was heated to the temperature of the test before being strained, and its expansion determined by a micrometer, and the coefficient of expansion of each grade of metal having been determined before the tests began, the temperature could be inferred with considerable precision. An abstract of five of these tests—the temperatures being all on the Fahrenheit scale—is in evidence that the strength of steel is greater at about 500 deg. than it is at 70. These five series of tests were made with five different qualities of steel containing respectively 0·09, 0·20, 0·31, 0·37, 0·51 per cent of carbon, and the percentage of strength was obtained by dividing the tensile strengh of a sample of steel at the given temperature by the strength of the same quality of steel at 70 degrees. The result presents the interesting fact that the specimens in question were all stronger in the neighborhood of zero than they were at ordinary temperatures—all of them, in fact, showing a minimum of strength at 210 deg. or thereabout, and a maximum of strength at about 550 deg.

ROCK emery millstones are said to be rapidly coming into use. It is claimed that they are wonderful grinders, and it seems quite natural that blocks of rock emery should cut faster and last longer than anything else.

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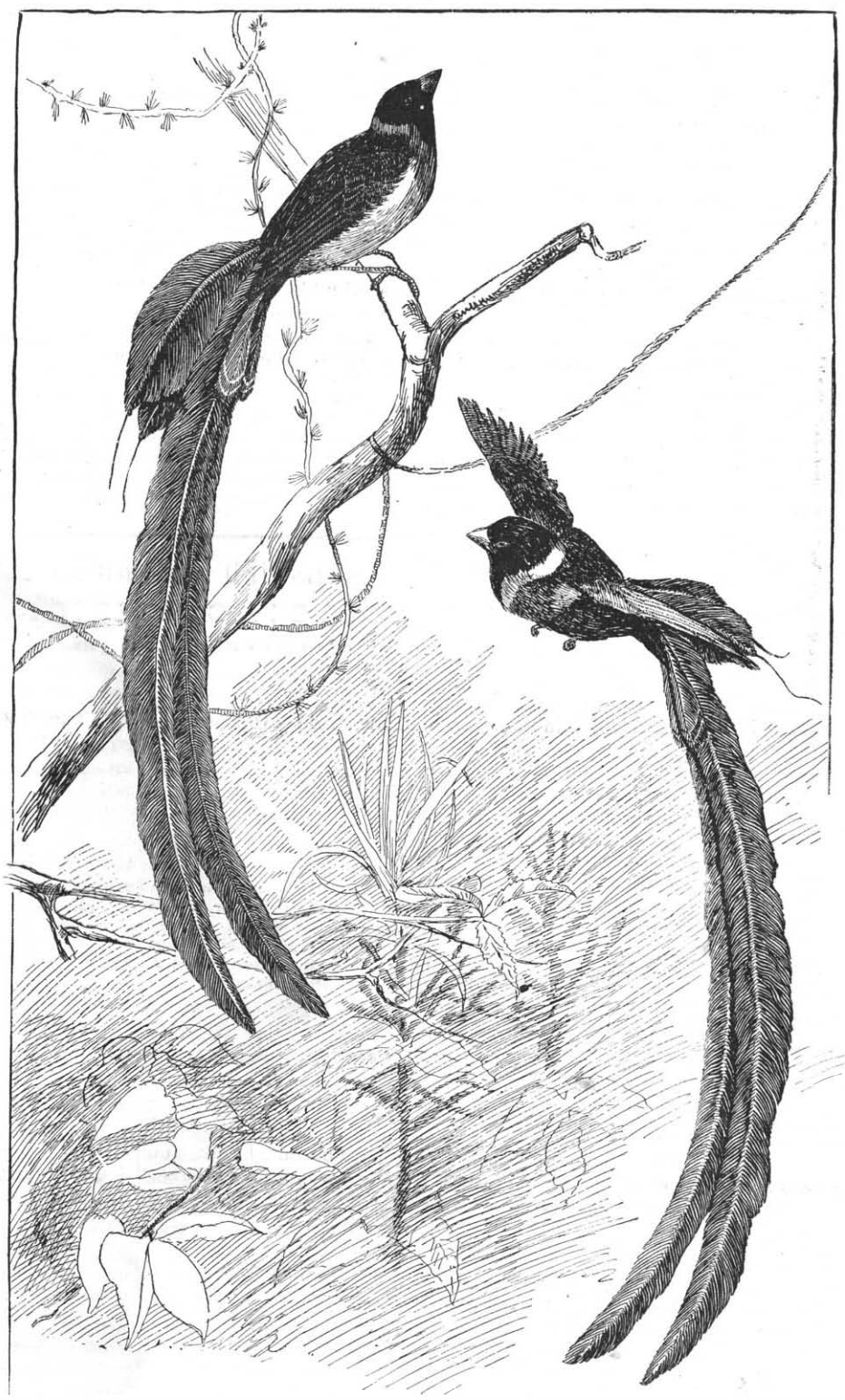
THE WIDAH BIRD OF PARADISE.

Through the kindness of Mr. W. Stoffregn, importer of birds, this city, we are enabled to give a representation of this beautiful bird. The widow bird of paradise, or widah bird, as it is called by the natives, is an inhabitant of Western Africa, being found throughout the districts of Senegal and Angola; and as it is of a light and airy disposition, it gives a lively aspect to the trees among which it lives. The paradise widah bird is very gorgeously clothed with softly tinted and gracefully shaped plumage. The general color of the male bird in his full dress is a deep black on the wings, tail, and back, with a collar of bright yellow. The head and throat are also black, the breast being a rich reddish-brown just below the throat to center of breast, where it softly melts into the pale color of the abdomen and under portions of the body. The tail of this bird is most singularly formed. Both webs of the two central feathers are extremely broad for about three inches, and then suddenly disappear, leaving the bare, slender shaft to project for about two inches. The two next feathers are equally elongated and rather broadly webbed, being nearly three-quarters of an inch wide. They are often more than eleven inches long, and sweep in a graceful curve from the insertion of their quills to the extremity of their points. All the feathers of the tail are set vertically, so that the profile is much more striking than the full view.

This bird has been commonly called the widow bird by many persons on account of its dark color and long train, as well as in consequence of its evidently disconsolate state when the beautiful tail feathers have fallen off after the breeding season. Of late years the widah bird has come into fashion in England and France as an inhabitant of the aviary. Some of the French dealers have succeeded in breeding these birds.

On account of its peculiarly long tail the widah bird requires a very roomy cage, with perches of considerable height and so arranged as not to interfere with its movements. It is very fond of bathing, and, like many other birds, bursts into a cry of gratitude when supplied with water.

Its nest is ingeniously woven from vegetable fibers, said to be wholly those of cotton down, and is divided into two compartments, one being for the use of the female and her eggs or young and the other for a seat for the male, whereupon he may perch himself to sing to his family. The broad-shafted widah bird is about the size of a sparrow, measuring between five and six inches, exclusive of the elongated tail feathers. After the breeding season the beautiful plumes fall out, and the whole coloring of the bird is changed from the deep black and orange into rusty brown and dull white. The proper name of this bird is widah bird, a title that was originally given to it by a Portuguese, because the first specimens brought to Europe came from the kingdom of Widah, on the eastern coast of Africa.



THE WIDAH BIRD OF PARADISE.

Power of Inventions.

It is not every one who appreciates the importance of helping the inventors along. They are the salt of the earth. Congress can well go out of its way to consider any law which to any extent will assist them in getting a fair return for their ideas. If a system of laws could finally be enacted giving full and fair compensation to each inventor promptly, as one by one he discovered the secrets of nature, there would not be, as there are at present, so many of nature's secrets hidden from us. We might find that, instead of this world being one of incessant toil, nature intended it to be one of comparative ease, and instead of being a world of incessant worry, perhaps we should find nature intended it to be one of comparative contentment.—*American Journal of Politics.*

THE Foster Engineering Company, of Newark, N. J., report great activity in the marine and railroad departments of their works. In addition to fitting out the Columbia with valves, they have an order for two 5 inch, two 4 inch, one 3 inch and eight 2 inch valves for the Indiana. The new warships of the Brazilian navy, the Nictheroy and the America, as well as the torpedo boats, were equipped with the Foster pressure regulator.

Conduction, Convection, and Radiation of Heat.

To have a change of temperature, it is of course necessary that heat should pass from one body to another. This can be done in three ways. These are called conduction, convection and radiation. When heat is transmitted by what is called conduction, it passes from particle to particle of matter. Each particle, we may suppose, as it receives more of that kind of motion which we call heat, increases the motion of its neighbor. When heat passes through a body of any kind by conduction, each particle of matter on its way is heated. The rate at which heat passes in this way is different in different bodies. Through silver, heat passes fastest by conduction, hence, we say that silver is the best of all conductors of heat. Copper has a conducting power 81 per cent as great as that of silver. Zinc is another very good conductor, its conducting power being about 64 per cent of that of silver. Heat is readily communicated from solids to liquids and from liquids to solids. When a particle of a liquid is heated by coming in contact with some hot solid, as, for example, the bottom of a dish in which it is suspended over fire, being expanded over heat, the colder and heavier particles press it upward toward the surface and themselves come in contact with the bottom of the dish. In this way the whole body of liquid or gas contained in a vessel is heated. This method of transmitting is called convection.

The third method by which heat may pass from one body to another is called radiation. Heat radiated does not pass from one particle of a body to another, but goes through air or a vacuum, or in some cases through solid bodies, with a different velocity from that with which it is conducted. Radiant heat does not heat the body through which it passed. Thus the heat of the sun may be felt even when it passes through a pane of glass covered with frost. Many of our readers will call to mind Dr. Kane's experiments of a burning lens made from ice. In this case the heat rays from the sun were brought to a focus by passing through the ice lens, which was not melted. Most gases allow radiant heat to pass easily. When open fires were used for heating, it was radiant heat chiefly that warmed the rooms. This left the air comparatively cool; in fact, the air was not warmed at all, save as it came in contact with the walls of the room or objects in it. One of the peculiar advantages of the old fashioned fireplace was the coolness of the air compared with the objects of the room.—*Canad. Arch.*

Amateur Photography in Russia.

Amateur photography has made but little progress in Russia. There are not, I believe, any photographic societies in that country, and one rarely, if ever, hears of a Russian amateur contributing to any of the international exhibitions. I have often wondered why this was so, and have at last discovered the solution of the problem. In this country one is free to go where one pleases and to photograph anything. Amateur photography thus becomes a pleasant and fascinating pastime. In Russia, however, things are different.

A gentleman who has resided for years in that country relates his experiences, and from these I gather the following information: To become an amateur photographer it is necessary to communicate with the police and obtain a license. This having, after considerable delay, been granted, it is advisable for one to be very careful where he or she is seen photographing. If one happens to be in close proximity to a fortress when discovered by the Secret Intelligence Department, he stands a chance of being dispatched on a free excursion to Siberia, where return tickets are not supplied.

Further, of every picture made a copy must be sent to the police authorities and another must be filed by the photographer for reference. The police have also the right at any time of the day or night to enter your dark room and examine everything therein and to search all of your photographic paraphernalia.

Nor is this all the unfortunate amateur has to put up with. All of his dry plates have to be imported (as they are not manufactured in Russia), and each box is opened and every plate examined. It is a wonder they do not immerse each one in a developer as well, to ascertain if there are any nihilistic communications latent in the film. Poor, suffering Russian amateur photographers! I would gladly extend to you my deepest sympathies, only I know it will be useless. Every line of this will be blackened out with an ink pad before any one in your country can receive this copy of the *Herald.*—*New York Herald.*

Alchemists' Alloys.

The alchemists of the middle ages were incessantly occupied with the endeavors to transmute metals. Many alloys were known to them which are lost to us, and their recipes contain many useful hints, worthy of the attention of modern scientists. There is curious book in the Bibliotheque Nationale, entitled *Liber sacerdotum*, the book of the priests. It is supposed to have been written by the Jewish priests, but probably dates from the eighteenth century. Here is one of the curious recipes contained in this book: Mix a quantity of iron filings with a quarter of its weight of red orpiment. Press the mixture in a linen cloth, inclose in a smelting pot, and leave it for a whole night in a heated furnace. Next add some oil and natron, and just as much copper filings as there is iron, melt all together, and the result will be a fine material for hammers.—*Berthelot, in the Annales des Chimie et Physique, Paris.*

THE *Centralblatt fur klinische Medicin*, for December 9, mentions an expedient described by Dr. Naegely, in the *Mercredi medical*, 1893, No. 31, for cutting short the paroxysms of whooping cough and for the treatment of trigeminal neuralgia, hemicrania, globus hystericus, and nervous vomiting. It consists in seizing the two greater cornua of the byoid bone with both thumbs and holding the bone, together with the larynx, up for from sixty to ninety seconds. The efficacy of this manipulation is said to have been proved in a sufficient number of cases. The author cannot explain its *modus operandi*, but he thinks it calls an inhibitory reflex into play.—*N. Y. Med. Jour.*

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RECENTLY PATENTED INVENTIONS.

Engineering.

STEAM SHOVEL.—Jake M. Boudrie and Thomas McManus, Rulo, Neb. This improvement provides for the shovel a platform consisting of flat cars, with means whereby the shovel may be made to travel from end to end of a train of cars, thus dispensing with the heretofore necessary side track in the loading or unloading of flat cars. Means are also provided whereby the loading of a train may be commenced at one end, and as each car receives its proper load, the shovel may be carried to the next car, and so on, until the desired number of cars has been loaded. The shovel is so placed upon the flat car that when the shovel is in operation it may be rigidly held upon the car.

FURNACE TAP.—Edward P. Mathewson, Pueblo, Col. According to this improvement a water-cooled tube is adapted to extend into the furnace to pass into the molten slag nearly to the matte level, the outer end of the tube being adapted to discharge into a slag spout arranged on the outside of the furnace. The invention relates to a former patented invention of the same inventor, and provides a simple and durable construction arranged to conveniently separate and quickly run off the slag at all times.

Railway Appliances.

CAR COUPLING.—William F. Donnell, Rush Tower, Mo. The drawhead, according to this improvement, has a rearwardly curved hook on its front end and a longitudinal slot at each side of the hook where a link may hang pendent, while there is an inclined tilting plate to the rear of the hook, the latter being loosely engaged by coupling link. The device is designed to automatically couple two approaching cars, and effective means are provided for uncoupling, either from the top or sides, the construction being very simple and practical.

RAIL SHOE AND BRACE.—Andrew B. Snider and William H. Roberts, Bartholow's, Md. This device consists of a plate having on one side a hook-shaped rail base flange and on the other side a shoulder, forming a rail seat between them, with spike holes at the edge of the shoulder and opening into the rail seat, the plate being extended horizontally upon one side and having spike holes on the extended side only. The device is especially devised to effectively hold the rails on curves where they are subjected to excessive pressure in one direction.

ELECTRIC RAILWAY SIGNAL.—José Ortega y Espinosa, Mexico, Mexico. This invention provides a signaling system consisting of two independent electric circuits, one extending along the line of the roadbed and provided with electro-magnets controlling the connection of contact faces and current-shifting devices with automatically operated signals at the stations, and the other circuit being carried by the car, having a signal bell and terminating in electrical contacts adapted to come into bearing with those on the roadbed. The system is designed to notify not only the stations of the road, but also the engine running over the road that another engine is coming in the opposite direction, thus lessening the liability to collisions.

ELEVATED RAILWAY.—John N. Valley, Jersey City, N. J. This is an improvement in a line with several similar inventions by the same inventor relating to a class of railways in which the track is supported from posts, the track rail being suspended from a longitudinal stringer. The invention provides a ready and simple means of grading the track rail to compensate for irregularities of the ground, there being an adjustable support for the track whereby the point of connection with the posts may be made higher or lower as desired, the grading being thus effected by unskilled labor.

Mechanical.

COMBINATION TOOL.—Charles Becker, Little Berger, Mo. A tool especially adapted for use as a pipe wrench and cutter has been designed by this inventor. By its use a pipe may be firmly gripped and turned without injury, and it may also be quickly adjusted to cut a pipe of any size, while by separating the head from the remainder of the tool it may be made into a convenient hammer and screw driver.

TOOL HANDLE FASTENER.—Leon R. Ligier, Douglas, Wyoming. This improvement is especially designed for fastening the handles on picks, hammers, etc. A collar slides over the tool handle nearly to the eye of the tool, and the collar is then connected by braces with the tool proper at each side of the eye, very firmly securing the tool to its handle.

PLIERS.—Frank C. Neuhaus, Kinkler, Texas. In this tool the gripping faces of the jaws have a longitudinal ridge and a corresponding groove, with opposite meeting faces on each side of the ridge and groove, thus forming a tool adapted to bite and kink a wire in a novel and superior manner, and one well adapted to facilitate the stretching of wire in building wire fences.

BRICK MOULD.—Charles A. Shultz, Rondout, N. Y. According to this improvement, bricks with rock faces may be made in any of the ordinary brick machines, and as economically and rapidly as bricks of the ordinary pattern. The mould is divided into compartments, each of a size to form a double brick, but with a rib marking the normal line of separation, and when the double brick has become partially dried the parts are separated on the line of the rib, forming an uneven face where the portions are broken away from each other.

PRINTING PRESS.—Hynek Breuer, New Prague, Minn. This is a hand press in which the impression is made by the cylinder being rolled across the bed, and the invention provides therefor an automatically rocking tympan, whereby, as the impression is made, the type will contact only at the point at which the impression is taken, the tympan automatically carrying the paper or other material printed immediately away from the face of the type after receiving an impression. The press is also adapted to print a clear, sharp, and fine impression, effectually preventing smudging, and doing the work rapidly.

Miscellaneous.

POWDER AND FUSE WARMER.—Albert Price, Marysville, Montana. A case is divided into partitions having at the top a powder tray, at the sides fuse compartments, and centrally a heating compartment. A metallic candle holder supports the candle to be burned in the latter, and the partitions are perforated, thereby affording a dry heat for thawing or softening powder, fuses, or anything containing nitroglycerine, there being no possibility of overheating the powder chamber.

HORSESHOE.—Arthur E. Ogden, Ashley, North Dakota. This shoe has two sections of unequal length pivoted together, each section having an inwardly and upwardly extending flange, the longer section with a recess at its pivoted end and the shorter section with a latch head entering the recess, a rod passing through apertures in the ends of the sections. The shoe also has removable calks, readily placed or removed, the shoe being adapted to fit the foot perfectly and so shaped that the weight of the animal will hold the calks in position.

WIRE STRETCHER AND HOLDER.—John R. Brabston, New Bell, Miss. A chain having a hook plate on its free end is shackled to a forked handle bar, another chain in two sections being shackled to the bar near its opposite end, a snap hook connecting the chain sections, and there being a claw hammer head on the straight end of the bar. The implement is especially adapted to hold a wire taut while being secured to a post, to hold loosened wires in position while a post is removed, and also to readily remove fence wires, serving also as a reel shaft when old wire is to be reeled for use again.

CLOTHES PRESS.—Huldah A. Shepard, Nelsonville, Ohio. This is an apparatus for pressing clothes to remove the moisture, and is especially designed for laces, table linen, and clothing which may be evenly folded. It has an outer and inner vessel, the bail of the latter having a central bearing for a hand-operated screw on the lower end of which is a follower, by means of which pressure can be brought to bear on the clothes, folded and placed between boards, or double perforated hollow partitions or spaces.

DOOR CHECK.—John Speirs, Jersey City, N. J. This is an adjustable fastening device comprising a locking link with an eye contracted at one end, the link being offset to bring the contracted end of the eye at an angle to its larger portion, while a separate chain moves freely through the larger portion of the eye, but interlocking with the link when in its contracted end. It is not only adapted for use as a door securer, but may be employed for suspending and lowering ships' boats from the davits and for other purposes.

WINDOW.—William Wallace, New York City. A perfectly air, water and burglar proof window has been devised by this inventor, the window being also readily opened to be cleaned from the inside. Pivot plates or bearings on the sash have adjustable pivots entering sockets in the frame, and the weather strips have a ridge entering a recess in the sash and an opposite ridge overlapping the edge of the window frame.

HANGER.—William H. Case, South Oil City, Pa. This is a simple and inexpensive device designed to conveniently support a normal length shade roller and curtain pole, irrespective of the width of the window. It is made of a single piece of wire formed at its ends with integral brackets, provided with curtain roller and shade roller brackets, the wire between the brackets being corrugated vertically to provide for lengthening or shortening the hanger.

BOOKBINDER.—John B. Johnston, Malta, Ill. This device comprises grooved strips having lugs at each end adapted to clasp a cover and through which binding wires are adapted to be passed, the ends of the wires being turned down in the strips and held by cap pieces. It is an extremely cheap and simple binder, readily applicable to newspapers, magazines, etc., and for holding covers on periodicals, while it may be made quite ornamental.

DRUM.—Morton E. Converse, Winchendon, Mass. This invention relates to the head sections of drums, which are so made as to be readily removed from the body, the chines and flesh hoops remaining as securely connected as when each head section is upon the body, thus enabling the drums to be dismounted and the heads and bodies nested for shipment.

EXHIBITING DEVICE.—Edwin B. Lunbeck and Clarence P. Cummings, Monte Vista, Col. This is an exhibitor especially adapted to hold and advantageously display mineral specimens. It comprises a blank of spring metal formed with struck up tongues whose free ends form notches, one of the tongues being bent to operate in connection with an adjacent tongue, and the blank being fastened to a suitable supporting base or in position in a case.

BUCKING BRONCHO TOY.—Elmo F. and Levi B. Kellum, Cripple Creek, Col. This is a mechanical toy representing the broncho and its rider, and as the platform on which the animal is mounted is drawn forward or pushed backward, the animal automatically assumes alternately a normal and a bucking position.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

THE SNOW-CHURCH COMPANY'S LEGAL AND BANKING YEAR BOOK FOR BANKERS, LAWYERS, AND THE BUSINESS PUBLIC, 1893. Collection laws revised to May 31, 1893. New York: The Snow-Church Surety Co. Pp. 1315. Price $5.

This extensive work contains the collection laws of the different States of the United States revised to May 31, 1893. The laws are arranged under alphabetical heads, and separately for each State, so that it forms an exceedingly convenient summary for use by business men. Various useful tables, such as those of area and population of different States and of points accessible to banking towns, are given. It is designed not necessarily to supplant legal consultation, but in many cases may precede the same with advantage.

ADDRESSES DELIVERED BEFORE THE WORLD'S RAILWAY COMMERCE CONGRESS. Held in Chicago, Ill., June 19-23, 1893. Official report. Chicago: *The Railway Age and Northwestern Railroader*. 1893. Pp. v, 265. Price $3.

The railway law and legislation, railway management and operation, railway employes and railway history and development are the topics covered in some 25 papers and divisions of this work, as representing the main advanced thought of the railway men of this and other countries. The book is to be highly recommended.

COMPOUND LOCOMOTIVES. By Arthur Tannatt Woods. Second edition. Revised and enlarged by David Leonard Barnes. Chicago: *The Railway Age and Northwestern Railroader*. 1893. Pp. xiv, 330. Price $3.

Cornell University, of which Mr. Woods is a graduate, is in a certain sense identified with compound engines. This excellent treatise, with glossary, satisfactory index, and appendices illustrated liberally, should, at the present day, be peculiarly welcome to engineers when the movement in favor of compound engines on railroads is so very pronounced. The important subjects of condensation in cylinder and the starting power of locomotives, both of so much importance in compound locomotive engines, are specially treated. Three and four crank compounds and antomatic starting gears are examples of the author's topics, while a short chapter is devoted to the reasons why economy obtains in compound locomotives—a subject very little understood by many, perhaps even by many of their advocates.

AN ELEMENTARY TREATISE ON THEORETICAL MECHANICS. By Alexander Ziwet. Part II. Introduction to Dynamics. Statics. New York and London: Macmillan & Co. 1893. Pp. viii, 183. No index. Price $2.25.

The second part of Professor Ziwet's treatises is devoted to the introduction of dynamics and to statics. The calculus and higher mathematics are used throughout and at the end of the book are given the answers to the problems.

SCIENTIFIC AMERICAN BUILDING EDITION.

DECEMBER, 1893.—(No. 98.)

TABLE OF CONTENTS.

1. Elegant plate in colors showing a colonial residence at Stamford, Conn., recently erected for C. Cooper Clark, Esq., at a cost of $9,500 complete. Floor plans and two perspective elevations. An excellent design. Mr. Augustus Howe, architect, New York.
2. Plate in colors showing the residence of Thomas C. Wordin, Esq., at Bridgeport, Conn. Two perspective views and floor plans. Cost $5,000 complete. A very attractive Queen Anne design. Mr. Henry A. Lambert, architect, Bridgeport, Conn.
3. A dwelling erected for Edward W. Alling, Esq., at New Haven, Conn. Perspective and interior view and floor plans. An excellent design. Cost $4,500 complete. Messrs. Stilson & Brown, architects, New Haven, Conn.
4. A very attractive residence recently erected for R. Burton, Esq., at Hartford, Conn., at a cost of $7,800 complete. Floor plans, perspective view, etc. Mr. Henry D. Hooker, architect, New York. An excellent design.
5. Engravings and floor plans of a suburban residence erected for H. McKay, Esq., at Boston, Mass., at cost of $2,400 complete. Mr. Austin W. Peasc, architect, Boston, Mass. A very attractive design.
6. A dwelling recently erected for P. H. Lucas, Esq., at Chester Hill, Mt. Vernon, N. Y., at a cost of $7,000. Floor plans and perspective elevation, also an interior view. Mr. Louis H. Lucas, architect, Mt. Vernon, N. Y.
7. A cottage at Mystic, Conn., erected at a cost of $3,000 complete. Elevation and floor plans and an interior view. Mr. John S. Rathbone, architect, New London, Conn.
8. A dwelling recently completed at Stamford, Conn., at a cost of $3,500 complete. A picturesque design. Two perspective views and floor plans. Messrs. Munn & Co., architects, New York.
9. Miscellaneous Contents: The education of customers.—How to catch contracts.—Hints to readers.—The latest and best designs for houses.—Labor Day—Tests of paving materials.—The World's Columbian Exposition, a general view.—The builders' friend.—A durable and ornamental roof, illustrated.—An improved woodworking machine, illustrated.—The Pasteur filter, illustrated.—The Rochester parlor heater and improved oil stove, illustrated.—A stovepipe radiator, illustrated.—An electric passenger elevator at the Exposition, illustrated.—Woodworking machinery at the Fair.—A new building material.—Torsion braided wire mattresses, pillows, cushions, etc., shown at the Exposition, illustrated.

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Pipe frame truck baskets, steel and wooden trucks, etc. L. M. Moore, Rochester, N. Y. See page 399.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

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The "Olin" Gas and Gasoline Engines, from 1 to 10 horse power, for all power purposes. The Olin Gas Engine Co., 222 Chicago Street, Buffalo, N. Y.

Send stamp for circular of castings and parts of the dynamo-motor advertised on page 336, Scientific American. Elbridge Electrical Mfg. Co., Elbridge, N. Y.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

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Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(5638) C. W. B. asks: 1. What adhesive substance can be used to hold firmly glass mounted on wood? Must be strong enough to resist the suction of rollers on printing press. A. Sealing wax. 2. What can be used to prevent hydrofluoric acid from etching on glass, *i. e.*, for relief work? A. Beeswax or paraffine wax.

(5639) C. E. N. asks: 1. Could a ¼ horse power motor be run by Leclanche batteries, if not run over 1 minute at a time and not more than ten times a day? If so, how many would it take? A. It would require about 200 cells. 2. Also, how can I make a silver plating solution? A. For electroplating see our SUPPLEMENT, No. 310, 10 cents by mail.

(5640) S. G. asks: 1. At what temperature will sulphur sublime? A. About 752° F. 2. What cantharidin? A. It melts at 425° F. to 450° F., and sublimes freely below 450° F. 3. Can I extract cantharidin from cantharides by sublimation? A. Extract with ether. Do not try to sublime it directly. 4. Will dry salt sublime, either alone or with other dry substances? If so, what is it? A. Yes; at a white heat, unmixed. 5. Can I make clear glass bottles answer for retorts? A. No; use regular retorts or round-bottomed chemists' flasks. 6. Is there any publication on the use of retorts? A. Not on this subject alone. We send you our book catalogue, whence you can order anything that meets your ideas. 7. Will you please tell me how a sand bath is prepared? A. It is a plate or tray filled with sand and kept hot over a fire.

(5641) F. R. D. asks what treatment to give horn (scrap) in order to get in condition for moulding in steel dies with hydraulic pressure. A. Horn scrap can be softened for moulding by heating to a temperature of 275° to 300° Fah., by steam or a linseed oil bath. For

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steaming, a strong tank with quick-opening door, equal to a steam pressure of 120 pounds per square inch, will be required. An air-tight iron box heated in an oven to the required temperature may be used for small operations. Again, for buttons and small work heated dies may be used. The heating is to be done by a Bunsen burner.

(5642) C. M. W. asks: In selecting coke for cupola purposes, how may the first or best quality be known from poorer grades, without trying it in the cupola, and why is it that the poorer grades resemble so closely in appearance the better grades, making it thereby so difficult to know anything about it without a cupola test? A. The carbon element in coke is the key to its quality for furnace work; 5 to 10 per cent difference in the amount of silica or ash cannot be discovered by surface inspection. An analysis only will show it. The only practical way is to obtain the coke from known sources of good quality by trial. The Colorado cokes appear to have more fixed carbon than the Connellsville cokes. Their faultiness may be in excessive sulphur and phosphorus. The Crested Butte field is said to be the best coking coal.

(5643) G. R. asks: How much work, foot-pound-minute, is the ordinary two horse tread power capable of developing, the tread power being the ordinary portable one as used in the country for thrashing? How much work, foot pound and minute, does the average two horse power gasoline engine exhibit in a friction brake applied to the driving pulley? A. The capacity of the horse treadmill depends much on the weight, strength and steadiness of pull of the horses. The friction absorbs probably 25 per cent of the power, so that the actual power delivered by two good horses may be 1½ horse power. The gasoline engine should have the actual power named in its size, or 33,000 foot ponnds per minute.

(5644) J. S. P. says: Will you please give the velocity of steam or the distance it will travel per minute? A. The velocity of steam flowing into a vacuum is about 1,550 feet per second at atmospheric pressure; at 10 atmospheres about 1,780 feet per second. When flowing through a hole in a plate into the atmosphere at 15 pounds pressure per square inch, the velocity is 650 feet; and at 20 atmospheres or 300 pounds pressure the velocity is about 1,600 feet per second.

(5645) W. J. B. asks (1) for a good formula for liquid glue. A. Two ounces gelatine, 4 ounces water; when the gelatine has fully swelled, add 2 ounces glacial acetic acid. It is used for mending china, glass, etc. 2. I have made a drum armature for the hand power dynamo (SUPPLEMENT, 161), but I have used iron wire instead of brass wire for binding on the wire, as is generally recommended. I have tried it, but it does not work very well. Would the iron wire around the armature cause this? A. The iron winding will do no harm. You must settle the position of the brushes by experiment. They should be on opposite extremities of the same diameter. As far as your drawing is intelligible, it would appear that all the bells in the case given would ring.

(5646) R. W. O. asks: Can a sailing vessel sail faster than the velocity of the wind at the time? What is the fastest time ever made by a sailing vessel crossing the Atlantic? A. A sailing vessel cannot sail faster than the wind under any conditions. The American clipper Flying Cloud made 374 miles in one day in 1851; the Dreadnought, New York to Liverpool in 1859, 13 days 8 hours, 3,000 miles; the same in 1860, Sandy Hook to Queenstown, 2,700 miles, 9 days 17 hours.

(5647) C. M. G. asks: Is there any electrical connection between the primary and secondary coils in an induction coil? A. There is none. For induction coil connections see our SUPPLEMENT, No. 160. 2. Also why is it that a needle laid gently in water will not sink for some time? A. It floats in virtue of the surface tension. The surface film supports it somewhat as a thin sheet of India rubber would. There is no question of porousness.

(5648) I. A. M. asks: The best month to cut hickory, so that the worms will not enter the wood when cut. A. January is the best month

(5649) J. J. A. D. asks: 1. The simplest way to make an air pump for experimenting. A. A large variety of air pumps of various forms have been described and illustrated in SCIENTIFIC AMERICAN SUPPLEMENT. See Nos. 224, 303, 629, 630, 631, 10 cents each mailed. 2. What is the process used in dipping and lacquering brass? Is there more than one way? A. There are many receipts for dipping and lacquering brass work, coloring, bronzing, etc., in the "Scientific American Cyclopedia of Receipts," $5 by mail.

(5650) W. B. asks for some process by which printing ink may be removed from paper, such as the page of a magazine, etc., without injuring the paper. A. Apply sulphuric ether to the ink with a little cotton wool ball, gently rubbing and using white blotting paper to absorb the ink; continue the operation until the ink is nearly all removed. The process is not very satisfactory.

(5651) E. H. P. writes: I wish to make a spark coil and all else that I can toward lighting my gas by electricity, some four or five burners. A. For a spark coil use a core of pieces of soft iron wire eight inches long made into a bundle about one inch thick. Wind it with four or five pounds magnet wire No. 18; a battery in open circuit with it, special electric burners, and a switch or push button are required. Address any dealer in electric supplies for fittings.

(5652) W. K. S. asks: Can a Crowfoot battery be made strong enough to run a motor with any power. A. Yes; but, owing to its high resistance and low voltage, a very large number of cells are required.

(5653) C. T. D.—The specimen sent has been identified by Professor C. V. Riley as being a large *Myriapod-spirobolus marginatus*, which, although dangerous in appearance, is quite harmless.

(5654) J. V. W. asks: 1. Will the chloride of manganese fume on charcoal before the blowpipe? What color is the flame? Are there any colors left on the coal? A. Not to any extent. The flame will show no characteristic color, and the coal will show a brown color, not characteristic. 2. What diluted acids can be used to dissolve the phosphate of manganese? Will the solution stay clear? If not clear, what color will appear? A. Hydrochloric acid or other mineral acid will dissolve it, giving a light pink solution. 3. What solution of manganese will stay green or blue? How prepared? A. None; the alkaline permanganates are dark violet or purple. 4. What is a neutral solution of peroxide of iron? A. A solution containing no free acid and not basic; for each equivalent of ferric oxide six bonds must be supplied by the acid. 5. Will a solution of hyposulphite of soda dissolve the phosphate of silver? A. Phosphoric acid dissolves it.

(5655) W. C. Mfg. Co. asks what the resistance of No. 22 and No. 24 German silver wire is per thousand feet. A. German silver varies in resistance. You may take 215 and 342 ohms respectively for 1,000 feet of No. 22 and No. 24 wire.

(5656) H. M., Jr., asks if cast iron rings can be used in armature of dynamo described in SUPPLEMENT 600. A. No. Use softest possible iron.

(5657) E. S. & S. ask: How would you change the winding of your 110 volt dynamo to produce a potential of 50 volts? A. Use half the number of turns on the armature, with wire of twice the diameter of that given. Wind field for one-half the resistance and same number of turns.

(5658) B. B. K. asks for the required amount of storage batteries to light fifteen 16 candle power 50 volt lamps, with plates of storage batteries 3 inches by 7 inches and ten plates to one cell; also how long it would take to charge them with a three light 110 volt dynamo. A. You will need 10 parallel series of 25 cells each. The dynamo, giving only a small amperage, will charge them very slowly—several days being needed to charge after exhaustion.

(5659) J. E. M. writes: I have the SCIENTIFIC AMERICAN SUPPLEMENT, April 14, 1888, No. 641, in which you give plan and figures for making a dynamo? Cannot this plan be enlarged to make a dynamo of two horse power to run on an arc circcuit? A. Yes. Wind your motor for the amperage of the circuit as if it were a dynamo to develop voltage equal to 746 × 2 ÷ amperage in question. The amperes in arc circuits vary according to the system used.

(5660) S. E. L. C. asks whether two 2,000 candle power lights will throw their rays of light farther than one 2,000 candle power lamp of the same voltage. A. In general terms, the more powerful lights would be seen farthest.

(5661) C. C. N. writes: 1. How long would it take to charge 200 storage cells, each one being 2 × 2 × 4 feet, with a 10 horse power dynamo? A. The dynamo would give a current of about 16 amperes. Divide the amperage of a cell by this figure and multiply by 10 for time of charging. 2. How long would it take to discharge them? A. Allow a rate of 6 amperes per square foot of positive plate. 3. How many horse power would they give on a motor? A. Multiply their amperage by 400 and divide by 746, and deduct 10 to 20 per cent for waste. 4. How often does the fluid have to be changed in storage cells where they are used ten hours each day, and how is the fluid made? A. It is dilute sulphuric acid, and occasionally needs slight additions of water or of acid. 5. What was the size of the storage cells used in the World's Fair electric launches? A. Address Electric Light and Navigation Company, 44 Broad Street, New York.

(5662) M. S. S. asks: 1. Can gravity batteries be used to light an incandescent lamp? A. Not practically. 2. If so, how many will it take to light a lamp of 10 voltage and 8 candle power? A. About 60 cells. 3. Should the number of the cells be increased if the candle power of the lamps is increased? A. Yes.

(5663) W. E. C. says: I have a cylinder, dimension 2½ inches by 10 inches, and wish to force 150 cubic inches of gas in with the air the cylinder contains. How much pressure will it take? Also how much pressure per square inch will the explosion of the gas in the cylinder exert? Does the gas consume the air? If so, what change takes place when the cylinder is opened? A. To put the quantity of gas into the cylinder as stated, the pressure on the pump will gradually increase from 0 to 44 pounds per square inch. It will not be explosive, as there is too much gas in proportion to the air. For the best explosive mixture, 6 parts of air should be mixed with 1 part of gas, when, by exploding, the pressure may rise to 120 to 150 pounds per square inch. When exploded, the product is nitrogen and carbonic acid gas, with a little steam formed by the union of the hydrogen of the gas with part of the oxygen of the air.

(5664) B. M. K. says: Some time ago we dug a new well, the water being soft when found. Since that we have walled the well with limestone and the water is very hard. Did the stone cause this? Will it be permanent? What would be the remedy? A. The limestone is probably the cause of the hardness. By drawing a larger quantity you may modify the hardness to a considerable extent; or if there is a deep water soil beneath the well, a drive pipe in the well and pump should give you soft water from the lower stratum.

(5665) T. A. C. says: I herewith inclose species of scale insect infesting our persimmon, peach, and orange trees. Some know it as "hutton smut scale." Will you let me know its species and any known remedy? This scale leaves a "smut" similar to that of "white fly." The latter is doing great damage in Central Florida, and is spreading rapidly, coming south at rate of about forty miles each season. Reply by Professor Riley.—The scale insect sent, and to which you apply the popular term "button smut scale," is the Florida Ceroplastes, also called the white scale and the wax scale (*Ceroplastes Floridensis*, Comstock). A full account of this insect will be found in Hubbard's "Insects Affecting the Orange," pp. 56–59. A perfectly satisfactory remedy consists in spraying with dilute kerosene soap emulsion at the time when the young hatch. The principal hatching times are first in April and May, second in July and August, and third in October and November. A full account of what is called "white fly" is to be found in "Insect Life," vol. v., pp. 219–226.

TO INVENTORS

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

December 26, 1893,

AND EACH BEARING THAT DATE.

(See note at end of list about copies of these patents.)

Acid, manufacture of para-amido-phenol sulphonic, Noyes & Clement ... 511,450
Acid, production of amido-naphthol disulphonic, M. Moeller ... 511,708
Alarm. See Boiler water alarm. Burglar alarm.
Auger for mining purposes, power, C. H. Sergeant ... 511,467
Bag. See School bag.
Baling press, P. & L. Trabue ... 511,665
Band cutter and feeder, S. G. Scholz ... 511,463
Bandage, abdominal, J. T. W. De Jong ... 511,336
Barrel hoop, J. Korman ... 511,439
Batteries, process of and composition for the manufacture of porous cups for electrical, F. G. Curtis ... 511,514
Battery. See Galvanic battery.
Bed bottom, spring, G. W. Crowder ... 511,513
Bed or mattress, inflatable air, S. Curlin ... 511,686
Bed, spring, C. W. Flint ... 511,691
Bedstead attachment, H. C. Loevenhart ... 511,340
Bell, electric, A. J. Oehring ... 511,451
Belt clamp, H. J. McKeon ... 511,710
Berth, sleeping car, A. E. Lard ... 511,533
Bicycle, M. Westbrook ... 511,479
Bicycle, J. L. Yost ... 511,395
Bicycle mud guard support, F. D. Cable ... 511,405
Bicycle padlock, A. Hubert ... 511,430
Bicycle wheel, F. Douglas ... 511,595
Bicycle wheel, J. L. Yost ... 511,394
Billiard table, W. H. Wiggins ... 511,571
Board. See Chart board.
Boiler furnace, J. Lister ... 511,536
Boiler water alarm, steam, P. A. Kirchner ... 511,529
Bolt cutter, M. D. Luehrs ... 511,441
Book, note, account, or other, A. W. P. Livesey ... 511,339
Boring mill attachment, C. L. Libby ... 511,736
Bottle and stopper therefor, E. E. Ellis ... 511,600
Bottle box or case, F. W. Becker ... 511,672
Bottle case, J. H. Nellis ... 511,643
Bottle washing machine, H. Reuter ... 511,361
Box. See Bottle box. Letter box. Patrol box. Powder box.
Bracket. See Folding bracket. Garment supporting bracket. Shelf bracket. Shingling bracket. Staging bracket.
Bridge, lift, W. Scherzer ... 511,713
Bridge, self-anchoring suspension, G. W. Frederick ... 511,605
Broom-corn sizing machine, M. Bassett ... 511,494
Brush, steel wire, F. Paquet ... 511,356
Buckle, rope, C. W. Baker ... 511,576
Bureaus, etc., mirror attaching device for, F. S. Sprague ... 511,660
Burglar alarm, J. F. Stirsky ... 511,370
Bushing withdrawing tool, R. Gregg ... 511,610
Button, collar, G. H. Strong ... 511,371
Button fastener, F. E. Williams ... 511,482
Button making machine, D. B. Sbantz ... 511,364
Buttoner, Latham & Williams ... 511,534
Buttoner, F. E. Williams ... 511,481
Cabinet, M. A. Owen ... 511,741
Calender roll, H. J. Frink ... 511,606
Can. See Garbage and ash can. Key opening can. Oil can.
Can bodies, machine for forming polygonal, Zimmerman & Underdown ... 511,486
Can e juice bleaching apparatus, L. F. Gaude ... 511,609
Canning and preserving, preparing fruit for, I. L. McDermett ... 511,709
Car coupling, E. D. Bond ... 511,390
Car coupling, J. Holum ... 511,427
Car coupling, A. R. Kantback ... 511,623
Car coupling, W. F. Richards ... 511,457
Car coupling, Z. A. & W. J. Sheram ... 511,654
Car coupling, S. Stump ... 511,556
Car fender, Cates & Reuschenberg ... 511,586
Car fender, J. W. McKinnon ... 511,640
Car fender, street, D. Flanders ... 511,604
Car life guard or fender, J. F. Ingraham ... 511,432
Car life guard, street, C. W. Howe ... 511,428
Car stake, P. Anderson ... 511,575
Car, street railway, G. Moore (r) ... 11,396
Car structure, railway, Cole & Grieves ... 511,588
Car to a motor thereon, means for transmitting the power of a moving, R. D. Gallagher, Jr ... 511,520
Car trolley bar carrier, J. C. Love ... 511,340
Car ventilator, M. B. Stafford ... 511,269
Caramel from distillery refuse, making, J. Moster ... 511,353
Carbonizing apparatus, I. L. Roberts ... 511,459
Carding machine condensing roll, wool, J. E. McWilliam ... 511,641
Carriage basket, baby, G. Marqua ... 511,537
Carriage gear coupling, N. A. Newton ... 511,541
Case. See Bottle case.
Cash register, W. H. Thompson ... 511,663
Cash register, indicator, and check printer, Ehrlich & Benton ... 511,743
Cantery apparatus, electric, Wotton & Bostrom ... 511,742
Chart board, J. S. Shepherd ... 511,552
Chasing mill, B. C. White ... 511,380, 511,382
Checkrein attachment, G. W. Hizer ... 511,697
Chopping or mincing machine, Wood & Davies ... 511,485
Churn, W. H. Curtice ... 511,484
Chute for transferring material, C. L. Harris ... 511,332
Chute, coal, Stuebner & Nies ... 511,557
Clamp. See Belt clamp. Nut clamp. Saw clamp.
Clay crushing machine, Urquhart & Mallory ... 511,566
Clock winding mechanism, tower, R. B. Carr ... 511,408
Cloth cutting machine, A. K. Thyll ... 511,562, 511,563
Cloth napping machine, E. Gessner ... 511,689
Clothes line clutch, R. Aucock ... 511,492
Clutch, W. Womersley ... 511,390, 511,391
Clutch lubricating device, P. Diebl ... 511,412
Clutch mechanism, friction, Babcock & Schmitt ... 511,320
Clutch, self-lubricating, P. Diebl ... 511,413
Coat, A. C. Watson ... 511,667
Coin-controlled apparatus, C. W. Delaney ... 511,594
Coke, making, G. C. Hewett ... 511,334
Collar, horse, L. Ingels ... 511,699
Commutation and a fluid electric commutator, electric, C. E. Emery ... 511,328
Compound engine, A. V. on Borries ... 511,581
Conveyer and manufacturing same, T. Wrigley ... 511,393
Cooker, steam, F. H. Moorman ... 511,351
Copy holder, D. M. Kirkpatrick ... 511,530
Cotton gin, roller, M. Prior ... 511,711
Coupling. See Car coupling. Carriage gear coupling.
Cover for cup, jugs, etc., removable spring, F. J. Mockler ... 511,538
Currier's beam, O. Geisler ... 511,521
Curtain holder, adjustable window, H. W. & E. W. Hutchinson ... 511,431
Cuspidor holder, C. C. Howard ... 511,617
Cutter. See Band cutter. Bolt cutter. Gear wheel cutter. Pipe cutter. Stalk cutter.
Cutter head for panel raising machines, F. Stutzman ... 511,471
Cutting material into curved forms, machine for, A. Olmesdahl ... 511,453
Cycle braking mechanism, R. E. Hammer ... 511,614
Cycle stand, J. S. Slater ... 511,367
Darning apparatus, H. Cardwell ... 511,681
Digger. See Potato digger.
Disks, mechanism for controlling the action of oscillating, F. Lambert ... 511,705
Display rack, H. W. McKinne ... 511,639
Distilling apparatus, C. H. Denison ... 511,730
Door opener, automatic, Plummer & Dinsmore ... 511,455
Door opening device, W. J. Weymouth ... 511,668
Door stop, Taylor & McElroy ... 511,662
Dough dividing machine, H. Boldt ... 511,499
Drain trap, T. J. Kieley ... 511,437
Drawer guide, D. M. Estey ... 511,601
Drawer, paper file, W. A. Borden ... 511,582
Drawing table, F. H. Selden ... 511,466
Drier. See Fruit drier.
Dye, blue, R. Kothe *et al* ... 511,532
Dye, blue, G. Schultz ... 511,653
Dye, blue-black azo, Diehl & Moeller ... 511,688
Easel, C. M. Carter ... 511,585
Easel, A. K. Cross ... 511,324
Educational apparatus, C. M. Stone ... 511,470
Egg beater, B. D. McDowell ... 511,637
Electric circuit safety device, C. H. Rudd ... 511,461
Electric conductor tension device, J. C. Love ... 511,345
Electric light extinguisher, automatic, Hughes & Reed ... 511,527
Electric light rosette, C. N. Hammond ... 511,613
Electric machines, current regulator for dynamo, C. D. Haskins ... 511,523
Electric machines, method of and means for compounding dynamo, E. Thomson ... 511,375
Electric meter, L. Baillie ... 511,401
Electric motor apparatus, W. A. Johnston *et al* ... 511,621
Electric wire covering, F. S. Randall ... 511,547
Electric transformer, J. J. Wood ... 511,574
Electrical conductor support, J. C. Love ... 511,344
Electro-magnetic engine, rotary, H. P. White ... 511,570
Electrolyzing apparatus, A. J. O. Chaland re ... 511,682
Elevator, J. P. Buckley ... 511,679
Elevator, J. A. Dean ... 511,726, 511,727
Elevator, C. W. Fowler ... 511,417
Elevator, W. B. Morris ... 511,447
Elevator, S. B. Williams ... 511,718
Embroidering machines, fabric holding frame for, A. Hardegger ... 511,622
Engine. See Compound engine. Electro-magnetic engine. Gas engine. Gas or oil motor engine. Gas or carbureted air engine. Locomotive engine. Petroleum or liquid hydrocarbon engine. Pump engine. Rotary engine. Steam engine.
Engines, safety reservoir and compensator for supplying liquid hydrocarbon to gas, W. W. Grant ... 511,694
Envelope machine, R. O. Brigham ... 511,676
Envelope machine attachment, R. O. Brigham ... 511,675
Eyeglass frame, E. L. McDowell ... 511,638
Eyeglasses, S. Eastman ... 511,598
Fan, rotary, R. Lundell ... 511,442
Fare receiver, T. J. King ... 511,704
Faucet, H. Reuter ... 511,360
Fence, wire, W. A. Norris ... 511,449
Fence, wire, J. L. Riter ... 511,458
Fence wire reel, W. J. & J. M. Opper ... 511,542
Fence wires, means for securing, C. H. Van Wagoner ... 511,378
Fender. See Car fender.
File for pointing lead pencils, etc., E. J. Koester ... 511,338
Fire alarm telegraph, C. H. Rudd ... 511,462
Firearm, breech-loading, J. M. Browning ... 511,677
Firearm, breech-loading, W. Mason ... 511,631, 511,633
Fire cracker, C. Nelson ... 511,644
Fire escape, J. F. Shaw ... 511,714
Fire escape or ladder, S. R. King ... 511,438
Fire extinguisher, A. A. Stempel ... 511,469
Fire kindler, H. L. Johnson ... 511,433
Flax, etc., machine for breaking and scutching, A. Morison ... 511,352
Flood gate, A. Dean ... 511,516
Flower pot machine, S. W. Clark ... 511,587
Fly frame, M. Campbell ... 511,725
Fly-paper holder, J. G. Dodd ... 511,689
Folding bracket, Kenison & Burk ... 511,626
Fruit drier, A. M. Chappell ... 511,504
Furnace. See Boiler furnace.
Furnace for roasting dust of copper and other ores, C. Vattier ... 511,476
Galvanic battery, H. T. Johnson ... 511,434
Garbage and ash can, H. E. Wolcott ... 511,484
Garment fastener, F. E. Bennett ... 511,577
Garment supporting bracket, J. J. Bisel ... 511,580
Gas burner attachment, B. F. Field ... 511,518
Gas engine, G. W. Lewis ... 511,535
Gas engine, Weeks & Lewis ... 511,478
Gas holders, overflow device for telescoping, F. V. Matton ... 511,444
Gas meter with rotating drum, dry, P. F. H. Sobolewski ... 511,368
Gas or carbureted air engine, Delamare-Debouteville & Malandin ... 511,593
Gas or oil motor engine, C. Stein ... 511,661
Gaseous fluid, tubular structure filled with, J. A. Sumovski ... 511,472
Gate. See Floodgate.
Gate, R. T. Mulcahy ... 511,635
Gear wheel cutter, F. J. Gay ... 511,607
Glass, making imitation beaded, E. Walsh, Jr ... 511,568
Glass mould, T. B. Atterbury ... 511,491
Glazing system, H. S. De Forest ... 511,325
Governor, electric motor, J. Marty, Jr ... 511,347
Gun, breakdown, J. Rider ... 511,362
Gun, breech-loading, W. Mason ... 511,632
Hammer, drop, White & Kittredge ... 511,381
Hanger. See Pantaloons hanger. Picture hanger. Trousers hanger.
Harrow tooth, J. M. Tomlinson ... 511,664
Harvester, corn, C. A. Bullard ... 511,405
Harvester, corn, L. G. Stewart ... 511,554
Harvester, potato, J. N. Cocker ... 511,511
Heater. See Trough heater. Water heater.
Heating and circulating hot water, apparatus for, R. H. Kersey ... 511,436
Heating apparatus boiler, C. W. Warnock ... 511,569
Holdback, vehicle, S. L. Bligh ... 511,498
Hook. See Whiffletree hook.
Hook, De Long & Kempsball ... 511,326
Hoop. See Barrel hoop.
Horse checking device, C. Roys ... 511,460
Horseshield, D. G. Feuney ... 511,568
Horseshoe, J. R. Anderson ... 511,489
Ice cistern covers, fastening for, A. M. Tippner ... 511,475
Ice cream freezer, H. W. Atwater ... 511,319
Incubator, C. D. Purvis ... 511,546
Inkstand, J. S. Ross ... 511,549
Insulator, C. N. Hammond ... 511,611, 511,612
Journal bearing, W. Small, Jr ... 511,656
Journal box, I. Metzger ... 511,445
Keybole guard, O. J. Davidson ... 511,592
Key opening can, J. Zimmerman ... 511,487
Kiln, A. Knacker ... 511,704
Knitting machine, circular, J. B. Hipwell ... 511,335
Lamp, C. W. Kempel ... 511,337
Lamp, chandelier car, E. Boesch ... 511,398
Lamp cord fire guard, Angell & Porter ... 511,720
Lamp, electric arc, R. Belfield ... 511,495
Land roller, C. I. & E. Williamson ... 511,389
Lantern, C. T. Ham ... 511,421
Latch, E. S. Wheeler ... 511,669
Letter box, house, G. E. Wilson ... 511,490
Letter port cover and name plate, combined, J. J. Bisel ... 511,722
Level, spirit, J. A. Trant ... 511,377
Lid for vessels, odor-arresting, W. Fowler ... 511,692
Lock, E. T. McKaig ... 511,738
Lock and latch, J. D. Perkins ... 511,454
Locomotive, W. J. Tripp ... 511,564
Locomotive, electric, J. G. McCormick ... 511,448
Locomotive engine, Klein & Lindner ... 511,531
Magnetic from non-magnetic substances, machine for separating, G. G. Crosby ... 511,512
Mail bag holder, G. B. Clark ... 511,509
Marker and coverer, corn or potato, S. Emick ... 511,329
Measuring apparatus, electric, T. Bruger ... 511,503
Measuring instrument, electric, E. Thomson ... 511,376
Mechanical movement, G. R. Peare ... 511,357
Meter. See Electrical meter. Gas meter.
Mill. See Chasing mill. Rolling mill.
Miners' bats, lamp support for, J. A. Simpson ... 511,265, 511,519
Mines, ventilating fan for, D. H. Fisher ... 511,555
Moisture in the air, apparatus for controlling, H. D. Streator ... 511,652
Mould. See Glass mould.
Motor for cars or other purposes, D. P. Sanders ... 511,500
Musical instrument, A. R. Breinl ... 511,671
Nail for fastening hides, T. L. Baumgarten ... 511,966
Newspaper holder, J. W. Sinz ... 511,728, 511,729
Nozzle, spraying, W. L. Deming ... 511,414
Nut clamp, J. B. Dolan ... 511,646
Nut lock, R. Holmes ... 511,446
Nut lock, J. R. Montgomery ... 511,465
Nut lock, J. C. Seger ... 511,448
Oil can and filler, E. W. Luce ... 511,396
Oven, baker's, A. Allen ... 511,330
Ozone gas, process of and apparatus for manufacturing, E. Fabrig ... 511,734
Packing, J. Hoffstadt ... 511,584
Packing for builders' use, sound deadening, S. Cabot ... 511,423
Packing, steam piston, S. P. Hinckley ... 511,673
Padlock, permutation, W. H. Bolthoff ... 511,578
Pantaloons hanger, A. Beraciert ... 511,659
Paper stuff boxes, machine for moulding, P. Sobege ... 511,599
Patrol box, W. Eglin ... 511,497
Pavement, G. E. Blaine ... 511,682
Pen holder, E. Faber ... 511,688
Pencil or style for writing on slates, D. von Sillich ... 511,687
Perspectives, etc., instrument for making, L. Dietmann ... 511,740
Petroleum or liquid hydrocarbon engine, J. Roots ... 511,651
Phonograph, W. Bruening ... 511,402
Picture, etc., hanger, Small & Entwistle ... 511,655
Pictures to watches, etc., securing, E. H. Brown ... 511,678
Piles, preserving, R. Sudden ... 511,372
Pipe cutter, T. R. Brien ... 511,501
Plane, H. Merz ... 511,349
Planter, corn, J. S. Mulholen ... 511,254
Plaster, manufacturing retarders for, J. R. McElvried ... 511,740
Plaster, wall, J. K. Jones ... 511,735
Pliers, hose band, C. F. Halstead ... 511,732
Plow knife attachment, E. Murphy ... 511,636
Plow, scraper, A. J. Burr ... 511,583
Potato digger, W. & T. Menzie ... 511,348
Potato digger, D. J. Rousb ... 511,550
Powder box, automatic, I. H. Twining ... 511,565
Power, electrical transmission of, N. Tesla ... 511,559
Power transmission, system of electrical, N. Tesla ... 511,560
Power-transmitting mechanism, Fisher & Nelson ... 511,415
Preserving clam extracts, G. W. Scollay ... 511,551
Press. See Baling press.

© 1894 SCIENTIFIC AMERICAN, INC

Projectile, L. Gathmann 511,418
Pulley, differential, W. Chapman 511,505
Pump engine, L. Holben 511,426
Rack. See Display rack.
Railway, cable, C. I. Earl 511,596, 511,597
Railway cattle guard, N. P. Walters 511,477
Railway conduit cleaning device, J. C. Love 511,341
Railway conduit, electric, H. D. Oler 511,452
Railwaycrossing, M. J. Keenan 511,624
Railway switch, automatic, C. S. Hoenes 511,425
Railway switching mechanism, electric, C. J. Kintner 511,627
Railway trolley, conduit, J. C. Love 511,342, 511,343
Railway vehicle, J. J. D. Clemmson 511,634, 511,635
Railways, converter system for electric, G. E. Hesse 511,524
Reel. See Fence wire reel.
Register. See Cash register.
Register and calculator, J. B. Benton 511,322
Resistance plates, making, C. E. Carpenter 511,407
Revolver, H. M. Caldwell 511,406
Revolver barrel strap catch, Johnson & Mossberg. 511,620
Rod. See Stair rod.
Roller. See Land roller.
Rolling mill, S. O. Haskin 511,422
Rolls, cleaning and scouring bot. W. H. Banfield. 511,493
Roof cresting or blp, A. M. Cheeseman 511,508
Roof leader strainer, J. White 511,383
Roofing, J. White 511,385
Roofing sheets, expansion joint for, J. White 511,384
Roofing sheets, jointing, J. White 511,386
Rotary engine, G. I. & G. Jorda 511,622
Rubber stamps, apparatus for manufacturing, G. J. B. Rodwell 511,548
Saddle, harness, W. Taylor 511,474
Sash fastener, J. P. Kane 511,702
Sash fastener, W. R. Walker 511,379
Saw and lath etc to be operated by foot power, combined circular, G. H. Furbish 511,331
Saw blade, G. Szekely 511,473
Saw clamp, L. Martenson 511,443
Sawfiling machine, B. Tholen 511,561
Sawmill setworks, W. A. Wilkinson 511,573
Scale, electric grain weighing, J. & D. D. A. Outcalt 511,647
School bag, J. E. Edwards 511,690
Scissors sharpener, Beers & Howland 511,397
Seal, F. W. Brooks 511,723, 511,724
Seal, car, J. Nadon 511,642
Seat. See Vehicle shifting seat.
Separator. See Teeth separator.
Sewing machine presser foot, H. Mundlos 511,589
Sewing machine, trimming mechanism, H. H. Fefel 511,603
Sewing on buttons, machine for, W. E. Bennett .. 511,496
Shaving mug, J. M. Biasl 511,323
Sheet metal beam, J. White 511,383
Sheet metal, embossing, J. White 511,382
Sheet metal working machine, F. A. Walsh 511,567
Shelf bracket, T. Corscaden 511,580
Shingling bracket, folding, M. F. Burk 511,721
Shoe, Postel & Morris 511,717
Shoe shank shaping machine, T. F. Tyler 511,666
Shovel, H. Ames 511,670
Signaling apparatus, electric, T. B. Doolittle 511,731
Signaling apparatus, fog, Boatwick & Duffy 511,490
Sorting or sifting apparatus, G. Eisner 511,517
Sphere, armillary, S. M. Gibbs 511,420
Spindle and bearing therefor, G. H. Allen 511,719
Staying bracket, Kenison & Burk 511,625
Stair rod, H. H. McBride 511,355
Stalk cutter and cultivator, combined, G. M. Snodgrass 511,658
Stalk cutter, root puller, and cultivator, combined, G. M. Snodgrass 511,657
Stamp canceler, J. F. Cowdery 511,410
Steam engine, R. T. Abell 511,488
Steel into wrought iron, converting cast, W. Parkinson 511,648
Still, H. Hinz 511,424
Stone cutting machine, T. Shea et al 511,715
Stone dressing machine, C. Lohr 511,628
Stopper fastener, G. Nichols 511,645
Stove, H. C. Willings 511,493
Stove, oil, De Mooy, Jr., & Clemes 511,757
Stovepipe shield for tents, W. C. Brown 511,502
Street sweeper, Palmer & Phelps 511,543
Sucker rod socket and elevator, L. R. Hitchcock. 511,525
Switch. See Railway switch.
Table. See Billiard table. Drawing table.
Tank for conveying acids, E. B. Bragg 511,674
Tanning liquor, M. Dennis 511,411
Tapping mains under pressure, machine for, P. Eley 511,327
Teeth separator, J. W. Ivory 511,619
Telephone, B. Pickering 511,358
Telephone exchanges, multiple switchboard system for, C. E. Scribner 511,464
Telephone system, F. R. Colvin 511,589
Telephone system, J. J. McNally 511,739
Telephonic instrument, P. Rabbidge 511,456
Tile roofing, A. M. Cheeseman ..... 511,506, 511,507.
Tile, sheet metal bulbous roofing, J. White 511,387
Tire for vehicle wheels, elastic, G. Hancock 511,733
Tire, pneumatic, J. Iddon 511,698
Tires, air valve for pneumatic, W. K. Genet 511,693
Tires, combined pressure gauge and safety valve for pneumatic, J. A. & H. A. Lamplugh 511,706
Trap. See Drain trap.
Trap for sinks, etc., J. O'Byrne 511,646
Trolley base, J. L. Mauldin 511,634
Trolley wire crossing, H. Geise 511,419
Trough heater, stock, A. Hayward 511,333
Trousers hanger, A. Beracierto 511,579
Truck frame for motor cars, C. E. Canfield 511,680
Truck radial car, L. J. Hirt 511,615
Trunk strap fastener, J. Mohring 511,350
Tube expander, H. L. Hopkins 511,526
Type writing machine, J. S. Foley 511,416
Type writing machine, C. F. Taylor 511,374
Type writing machine, Taylor & Brown 511,373
Upholstering device, H. B. Pitner 511,649
Valve, safety, C. Prusmann 511,650
Valve, straightway, J. M. Coale 511,510
Vehicle shifting seat, F. G. Davis 511,515
Velocipede frame, J. Ragoucy 511,359
Velocipede saddle, J. H. Sager 511,363
Ventilator. See Car ventilator.
Vise, bench, A. S. Hubbell 511,429
Vulcanizing apparatus, J. W. Lyon 511,629
Wagon dumping bed, W. H. Kauffman 511,528
Washing machine, J. B. Beam 511,321
Washing machine, R. F. Perch 511,545
Water closets, etc., flush tank for, L. Morford et al 511,540
Water heater, W. H. Marshall 511,630
Water wheel turbine, J. H. Staples 511,716
Waterproofing fabrics, J., Sr., & J. Miller, Jr 511,707
Wheel. See water wheel.
Whiffletree hook, J. F. Buck 511,553
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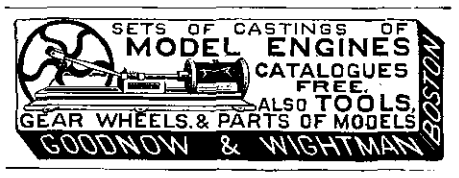

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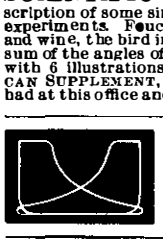

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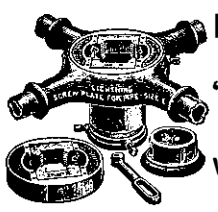
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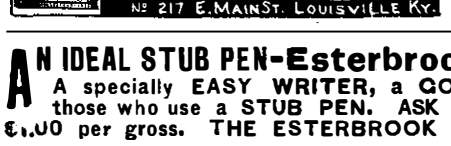
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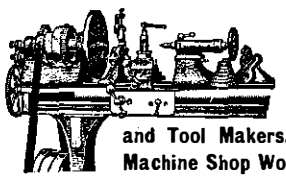
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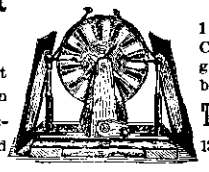
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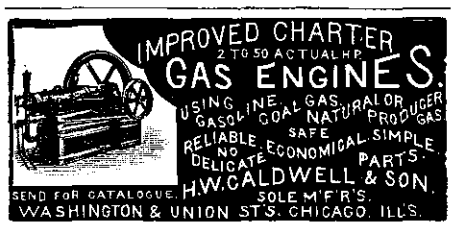
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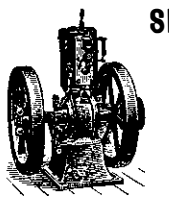
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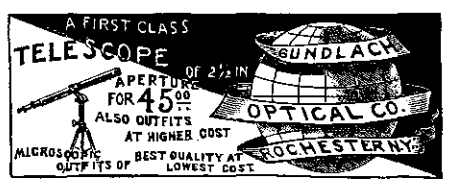

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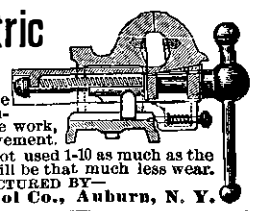
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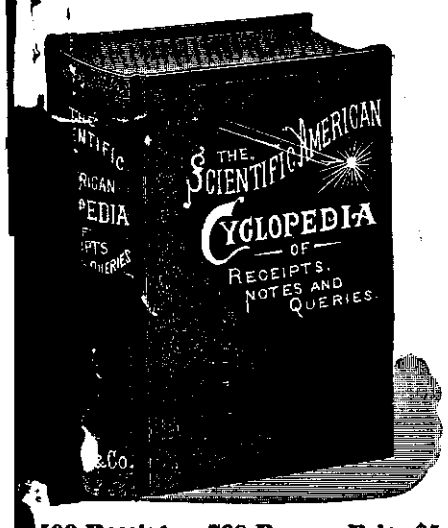

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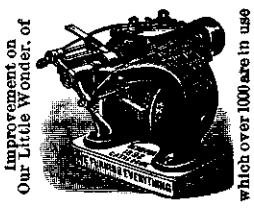
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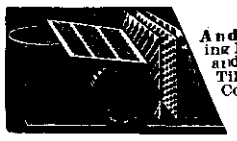
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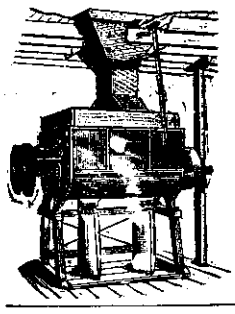
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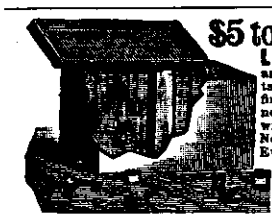
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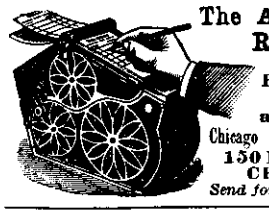
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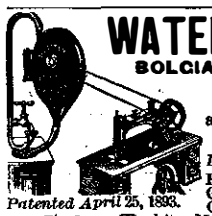

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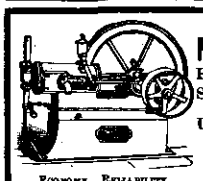

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This Company also owns Letters Patent No. 463,569, granted to Emile Berliner, November 17, 1891, for a Combined Telegraph and Telephone; and controls Letters Patent No. 474,231, granted to Thomas A. Edison, May 3, 1892, for a Speaking Telegraph, which cover fundamental inventions and embrace all forms of carbon transmitters and of carbon telephones.

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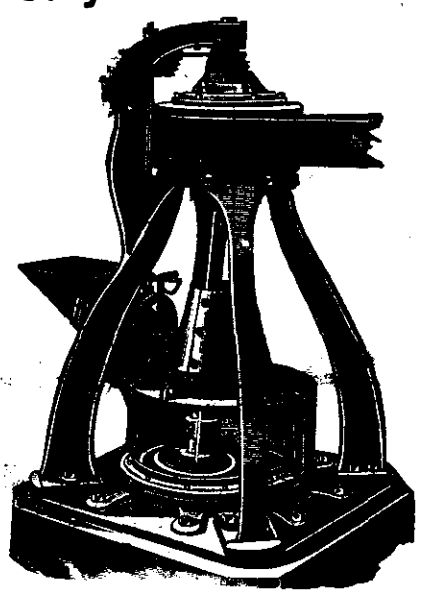

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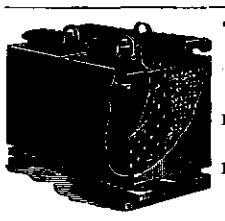

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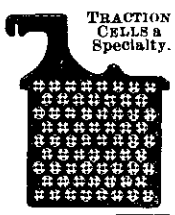

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